DTHC IV -SETUP/INSTALL MANUAL

REV 3.1
Aug 2015

For use with the following CandCNC products:

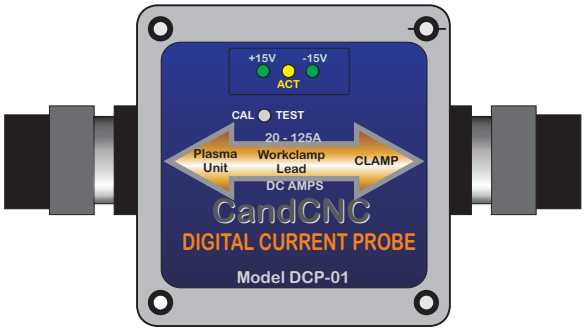
MP3000E-DTHCIV or later
BladeRunner (all versions) with DTHC IV option
Plazpak Series (all versions) with DTHC IV option
Ether-Cut Upgrades all series (DTHC IV)

Options

DCP-01 Digital Current Probe (11/02/2010)
DCC® Dynamic Cut Control
HyT-Connect® Hypertherm Connection Kits
TAP® Total Automation Plasma

Use this manual to install and setup a DTHC IV Expansion Module in the field for any of the above listed CandCNC products OR to setup and test the DTHC IV functions in a CandCNC Product that already has the DTHC IV Module installed.

Includes complete setup and testing of the new CandNC DIGITAL CURRENT PROBE



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FEATURES GUIDE FOR DTHCIV

This document describes a product from CandCNC that provides a new approach to Automated Torch Height Control. The DTHC MARK IV system is backwardly compatible with earlier CandCNC controllers using the DTHCII. The DTHC MARK IV is a 4th generation design using a faster more complex microprocessor and is the culmination of over 10 years of THC designs from the engineering team at CandCNC, and is the pentacle of high performance / low cost digital torch height control.

The DTHC IV has the following features: *(new features in RED)

Σ

Σ Compact Surface Mount Design. High Speed Processor, Boot Loader on chip for easy firmware updates

Σ Uses ECC (Electronic Cut Chart) for stored settings (2)

Σ RS485 C3Bus® communication using standard UTP cabling (CAT 5) (2)

Σ Isolated external HOLD circuit. No other inputs on BoB used or needed

Σ Works with MACH3 and LinuxCNC (3)

Σ Single Operator Console for all CNC settings and operations....no knobs, no manual settings.

Σ Supports Dynamic Cut Control on all plasma cutters (2)

Σ Usable with virtually any plasma cutter with or without CNC connectors (4)

Σ Z motion speeds ofup to 200 IPM with STEPPERS!

Σ Setup and testing via RS485 and Windows/Linux app “HUB ADMIN utility”(1)

Σ Z Response tuning has true PID settings to prevent overshoot and instability

Σ 6 Presets for response tuning cover most types of cutting and Z mechanical types

Σ Plug compatible with existing CandCNC MP3000’s and BladeRunner/Plazpaks after Aug 2012 (1)(5)

Σ Works with all forms of pulse interface (Parallel Port; USB; Ethernet) (4)(6)

Σ More than 5X faster than systems using MACH3 THC logic

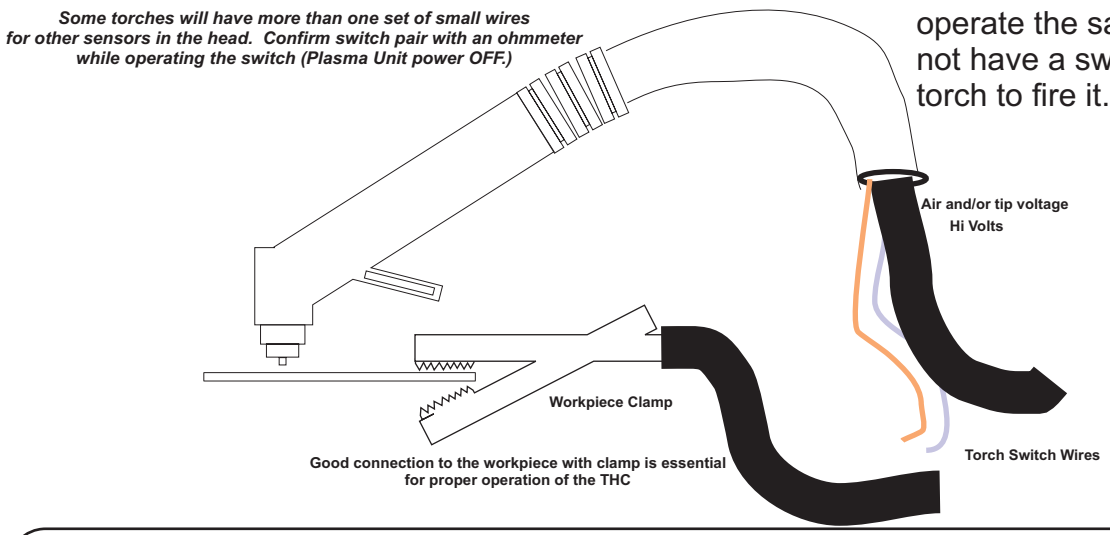
Σ Engineered to do extreme cutting including corrugated and HVAC type materials

Σ Unique Patent Pending Hybrid Design shares single Z axis allowing G-Code position control mixed with high speed local loop under DTHC control

(1) Requires optional USB to RS485 4 Port C3BUS Hub from CandCNC
(2) Requires SheetCAM TNG and custom CandCNC POST Processor
(3) MACH3 only until 2015. Contact CandCNC for more information.
(4) May require other options/ connection kits
(5) Upgrade kits available
(6) USB not recommended for most installs.

INTRODUCTION: How THC works

NOTE: Machine Torches operate the same but do not have a switch in the torch to fire it.


Some torches will have more than one set of small wires for other sensors in the head. Confirm switch pair with an ohmmeter while operating the switch (Plasma Unit power OFF.)
Air and/or tip voltage
Hi Volts
Workpiece Clamp
Good connection to the workpiece with clamp is essential for proper operation of the THC
Torch Switch Wires

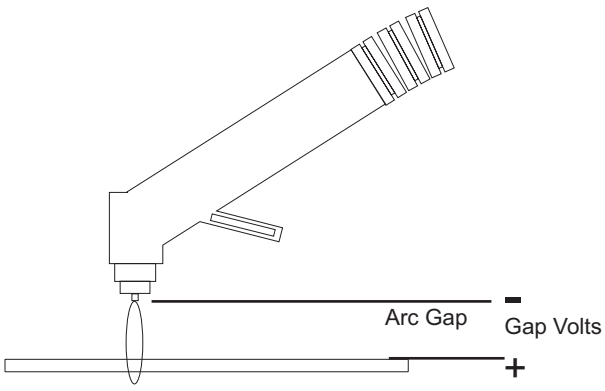
HOW DTHC (THC/AVC/DTHC) WORKS

Automatic Torch Height Control (often called just THC) works by reading the Arc Gap Voltage while cutting. Plasma uses constant current cutting. If the current stays constant and you vary the gap (either by moving the torch or moving the material UP or DOWN) then the voltage will change in proportion to the change in arc gap. Much like the altimeter on a plane (that measures barometric pressure to determine altitude) the Arc voltage indicates the RELATIVE distance from the end (tip) of the nozzle to the top of the material.

The change in voltage for a change in height is a small percentage of the overall cutting voltage. A 1% change in voltage (100 to 101 volts) is equal to several thousands (typically .015 or more) of arc gap change so the THC must be able to see and act on a small change in a large number.

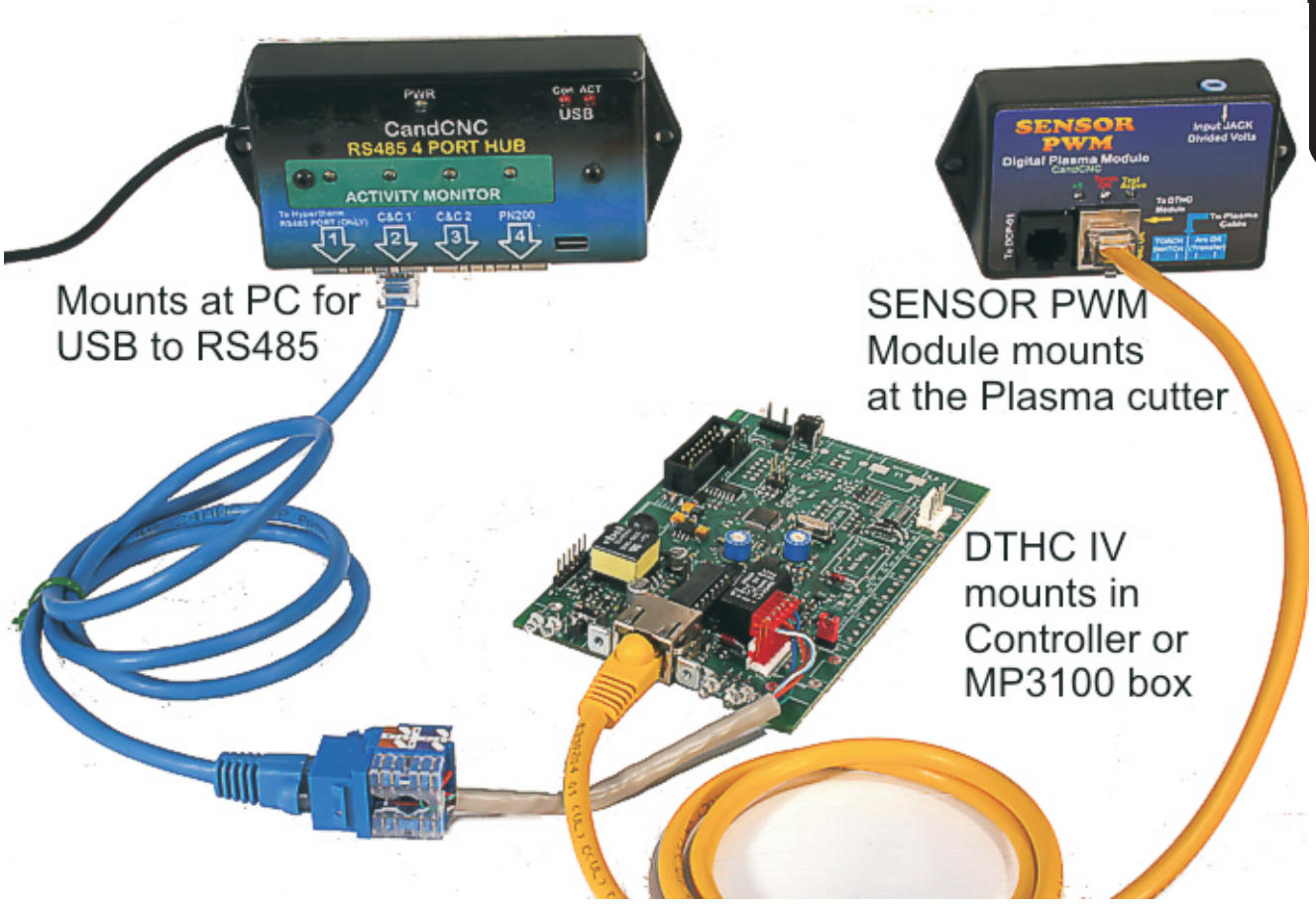
The THC control must take the actual cut voltage and compare it to a preset “target” and move the Torch Up or Down to try and correct the height based on it’s arc voltage. The process forms a “servo loop” where an “error” voltage from a preset is used to physically move the torch Up or Down to “correct” the error. Under normal cutting conditions the voltage stays constant with height but certain conditions that effect the arc gap voltage can skew the gap volts and cause the THC circuit to overreact. The feed rate (how fast the tip is moving across the material) determines the current density and the Gap Volts. A slower feed rate will cause an increase in Torch Volts (if no THC servo is there to correct). With THC engaged the circuit will sense the higher voltage and based on the error created lower the torch to try and compensate. This occurs if the arc crosses a void or existing kerf or at the end of a cut when the scrap drops out. The DTHCII includes an adjustable Anti-Dive (Tip Saver) that senses a rapid voltage spike and locks down motion.

- Arc Gap = Arc volts=Torch Volts
- 1volt (change) = approx .015”(change)
- >Arc volts = > Arc Gap. (greater the Arc Gap the greater the Arc Volts)
- Z moves opposite Arc Volts based on Preset Volts. Torch Volts Above Preset: LOWERS torch; Torch Volts below Preset: RAISES torch.
- Control has “window” (Span Volts) where no UP or DOWN occurs. (prefect cut height) Anything inside the Span (+ or -) from the Preset generates NO change. SPAN VOLTS is set in 1/4V increments in the Cut Profile



INTRODUCTION: DTHCIV Facts

C3BUS™ USB to RS485 4 Port Hub
See text for details



The following pages will cover the identification, hookup, setup and testing of the DTHCII Digital Torch Height Control System. Each card/module has a specific function and set of tests. A minimum system will consists of a DTHC II Expansion Module (interfaced to a CandCNC UBOB III Universal Breakout Board) and the THC Sensor PWM Module.

The DTHC IV is a later version of our popular DTHC II that was introduced in 2011, and is the 3rd generation DTHC and the 4th generation of Digital THC's from CandCNC. The DTHC line has always been a feature-rich product with advanced technology based on powerful embedded processor chips and modern surface mount components. From the innovative **Total Isolation** (including the analog Arc Volts readings) to the **Self-test** and built in **"Tip Saver" anti-dive,** the DTHC has earned a reputation for being solid, reliable and user-friendly, while offering the operator a wide range of options for precise cutting with plasma and all at a very effective price.

The DTHC IV builds on that success by making the product faster, with more features and the first ever "Shared Z " design for MACH3 for access Automation control signals in the plasma. Using the same PWM Module as the DTHC II, it takes a divided Arc Volts signal (available as an option on several plasma models or from our optional RAV-01 card) and changes the small analog signal to a constant level PWM signal that is many times more immune to external noise and EMF problems. Designed to work with your existing equipment including HF and CD start units or the most modern plasma units in built-in Automation Interfaces, it sets a new standard for Torch Height Control. You can pay MORE for a THC but cannot get more features or accuracy than the DTHC IV offers.

BLOCK DIAGRAM TYPICAL DTHC IV HOOKUP for Automation Interface

DCP-01
(option)

Used for ARC Current Readout; NOT Required

DTHC IV Module

Cat5 UTP cable

UP to 25 ft

Located in the control box with the UBOB III card

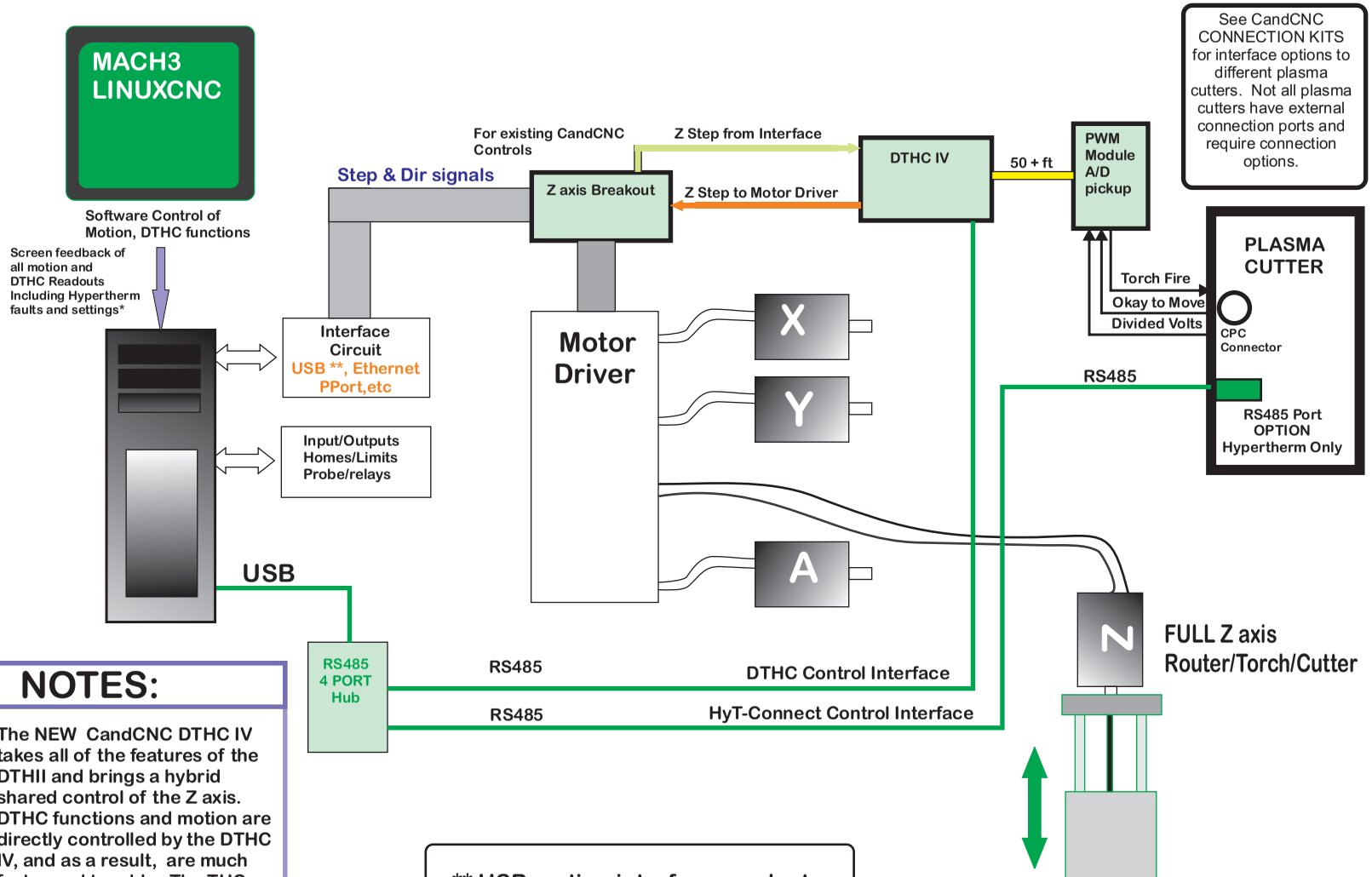
PWM MODULE
Plasma Pickup Module located external and close to the Plasma cutter

MIC-01 Custom Cable

CPC Plug on Plasma Unit

Single cable hookup to Plasma Unit

NEW DTHC IV BASED CONFIGURATION



NOTES:

The NEW CandCNC DTHC IV takes all of the features of the DTHII and brings a hybrid shared control of the Z axis. DTHC functions and motion are directly controlled by the DTHC IV, and as a result, are much faster and tunable. The THC loop is now closed at the DTHC IV so there is no longer a requirement for the THC logic in MACH3 nor for a real-time high speed set of inputs. It still offers the same high level operator interface and the Advanced DCC and TAP options and still allows full plasma

** USB motion interface products NOT recommend for plasma CNC installs due to possible noise issues

SIMPLIFIED SETUP STEPS
SETUP OUTLINE

NOTE some of these steps may already have been performed in the BladeRunner User Manual or MP3100/MP3500 User manuals. If so just check the settings and move to the next step

1.Install or update and verify Mach3 version 3.043.067 (on CD).

2. Run Master Installer X (or later version) to install the products you have from MENU. Master Installer for EtherCut products will automatically update Mach3 to version 3.043.077

3. If not already done , Install C3 BUS Hub and test that Hub Admin utility works and uses the hub.

4. Plug all components together per diagram.

5. For Ether-Cut products, follow the Ethernet IP setup in Windows and testing procedures.

6. If not yet done, Use Motor Tuning section in BladeRunner AIO User Manual to setup motor tuning in MACH.

7. Test JOG on all XY and Z axis and Simple G-Code (MDI) motion commands in MACH

8. Update the hub firmware and DTHCIV Device firmware if needed. (use Hub Admin to see firmware versions and update firmware)

9. Use HUB ADMIN and DTHC IV Setup section to test and calibrate the Z tuning for DTHC operation. Test JOG using screen buttons

10. Install the Plasma Modules (connection kit) and Make connections to plasma cutter.

11. Run tests in this manual to confirm operations

12. Run simple straight line tests with DTHC OFF (in MANUAL MODE) cutting metal to get baseline numbers and confirm configurations.

13. Install SheetCam TNG (can be same PC on Ether-cut systems).

14. Install SheetCam CandCNC Support file.to add in custom POSTS and Toolsets

15. Generate simple shapes files using correct post in SheetCam TNG and perform test cuts.

NOTE TO CUSTOMERS THAT HAVE PURCHASED A COMPUTER SYSTEM FROM CandCNC:

On PC's purchased from CandCNC steps 1 -5 have been done . Because every table is different, the motor tuning and the DTHCIV Z axis tuning **has been set to defaults** that will need to be adjusted to match what your system must have. You are responsible to do the remaining install and setup 6 - 15

Items in ORANGE are the most often skipped steps and cause problems getting the DTHC to work properly

LIST of STEPS to SETUP DTHC IV and ETHER-CUT SYSTEMS

- Open MACH with either the DTHC IV or the Ether-Cut profile (Icon) depending on which product(s) you have. For just DTHC IV (parallel port setup skip Ether-Cut install step)

- For the Ether-Cut install (which includes the DTHC IV) check that the ESS plug-in is working in MACH3. The Plug-In Control tab (top menu in MACH) should have several ESS choices in the list. If the Ether-Cut was not working you will not see the selections in the Plug-In Control List Box. DO NOT OPEN THE SELECTIONS in the list and make ANY changes. **The IP address WILL NOT display right even if you have communications** . There are indicators on the front of the Ether-Cut clustered around the Ethernet Jack that can be used to confirm connection and valid communications (see the chart in this manual).

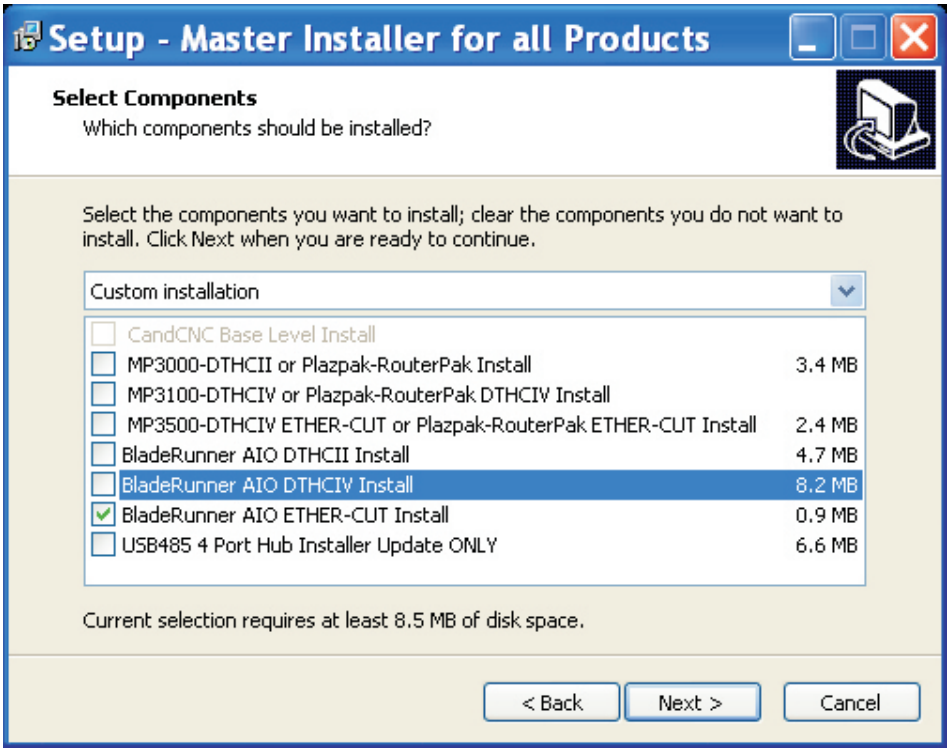
- Do some preliminary motion checks. If this is a new install and you have no motor tuning numbers to go from, refer to the Motor Tuning Section of the ***BladeRunner AIO User Manual*** (even if you have the MP3100-DTHCIV MP3500-DTHCIV Ether-Cut version or a Plazpak).

- Continue through the *DTHC IV Setup and Config Manual* to do the testing and fine tuning of the DTHC IV. There are settings and tuning requirements for the DTHC IV that are different than the DTHC II.

IMPORTANT! IF you are moving from a DTHC or DTHCII to the DTHCIV it is a radically different system and requires the tuning steps outlined in this manual. If you skip this than your results will be less than optimal. There are separate documents that will cover the physical part of the upgrade (swapping out the hardware) but the setup, calibration and testing of the new DTHCIV needs to be done using this manual.

Using the Auto Installers for CandCNC DTHC IV and EtherCut Controls

MENU SCREEN FROM MasterInstallerIII .exe...RUN THIS FIRST
SELECT THE PRODUCTS TO INSTALL YOU HAVE


Setup - Master Installer for all Products
Select Components
Which components should be installed?
Select the components you want to install; clear the components you do not want to install. Click Next when you are ready to continue.
Custom installation
CandCNC Base Level Install
MP3000-DTHCII or Plazpak-RouterPak Install 3.4 MB
MP3100-DTHCIV or Plazpak-RouterPak DTHCIV Install
MP3500-DTHCIV ETHER-CUT or Plazpak-RouterPak ETHER-CUT Install 2.4 MB
BladeRunner AIO DTHCII Install 4.7 MB
BladeRunner AIO DTHCIV Install 8.2 MB
BladeRunner AIO ETHER-CUT Install 0.9 MB
USB485 4 Port Hub Installer Update ONLY 6.6 MB
Current selection requires at least 8.5 MB of disk space.
< Back
Next >
Cancel

①

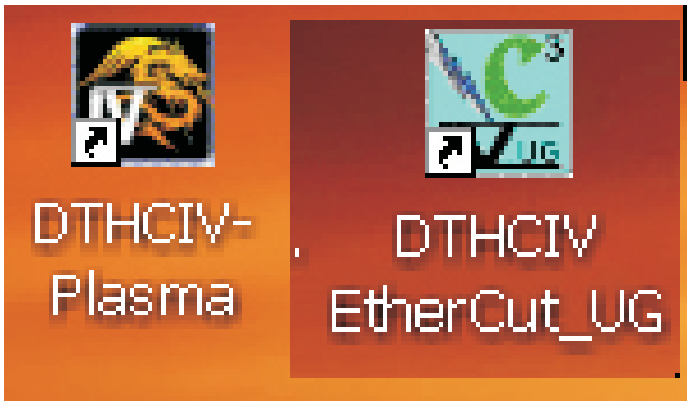
IF you are upgrading an existing setup make sure you first backup your whole MACH3 folder to a memory stick and THEN upgrade MACH to version 3.043.067 or later and run the *Master Installer* X (or later rev) FIRST. Do not select products you don't have or that you used to have. Either install the proper DTHC IV product or the Ether-Cut product you have, but NOT BOTH. **NOTE: Starting with Master Installer X the older legacy BladeRunners and MP3000 series products have been moved to another "Legacy Products Installer"** If you are upgrading or installing to a controller or interface CandCNC product made and shipped **prior to April 2014, you should use the Legacy Products Installer.** It will update screens, drivers and profiles but work with the UBOB III REV14 and older versions

After you have installed the Master Installer and have the icons for the products and can open the profile to indicate you got a successful install. You can come back and install again but it will put any profile back to default values and any changes you have made (like motor tuning and axis settings in MACH) will be back to the default values.

If you need to recover your motor tuning simply open the MACH folder off your memory stick and copy your old working profile back into the MACH folder on your computer. Most of the settings are totally different (Ports & pins for example) so use only the motor tuning VALUES in the new Profiles.

NOTE: MACH keeps backup copies of the XML profiles any time you make changes.
They are stored in a folder under MACH named XMLBACKUPS. In that folder you will find Files like "ETHER-CUT+TAP.xb11" . the suffix (after the dot) are "xb" + the version number. To recover you can find the highest version number and rename it with the "xml" suffix. First copy it to the main MACH folder as the xb# extension and then rename it . If you have one already named the same, it will refuse so first change the file extension on the bad XML file to something like ".old" than change the extension on the file you copied in to .xml

②



New PROFILES (ICONS) will be added to your desktop. You may have other CandCNC profiles from earlier installs.

If you do not have at least one of the new ICONS as shown above after running the DTHCIV+EtherCut_Install, it was not done correctly. Do the install again.

The new installers all put in a Router profile and Icon . This is a generic Profile made for Router that needs to be setup with the same motor tuning parameters as the Plasma Profile. It uses a different screen set and the outputs are defined differently but most other settings are the same. None of the DTHCIV settings in this Manual or the instructions for the DTHCIV Settings in the Hub Admin apply. Unless you have the PN200 Hand Control of other devices that use the RS485 beside the DTHCIV that part os ignored as well

C3BUS®

NOTE: In the Bladerunner EtherCut Manual and some other product manuals, the C3 Bus install is covered. If you already have a C3 Bus hub running make sure your hub firmware is current then skip the setup section and go directly to the DTHCIV Settings section in Hub Admin starting on page 19 of this manual

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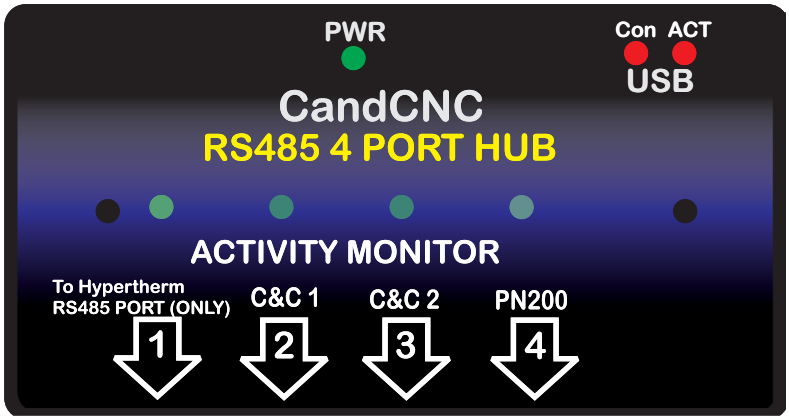
USB- RS485 4 PORT HUB
Plug Locations and Layout

This section may have already been done in the setup of your BladeRunner EtherCut or MP3500, if so just check the setup and use HUB ADMIN utility to check operation and FIRMWARE versions on the HUB and the DEVICES

C3BUS USB to RS485 4 PORT HUB

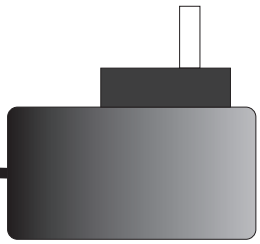
Handles all secondary (backside) communications to and from the DTHC IV to MACH3. All screen readouts and all settings to the DTHC IV are handle by the C3BUS. The HUB UTILITY uses the same C3BUS to communicate with all the RS485 modules including the DTHC IV. It is essential the C3BUS be installed and running BEFORE you attempt to setup the DTHCIV.

RS485 4 PORT HUB (TOP VIEW)



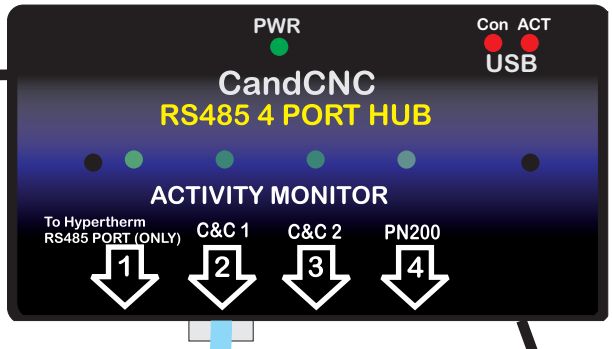
RS485 4 PORT HUB (END VIEW)

RS485 4 PORT HUB (FRONT VIEW)



Universal AC Power Plug
100VAC to 240VAC 50/60HZ
Regulated 5V @ 1A out

USB ACT LED shows valid connection to PC on USB channel



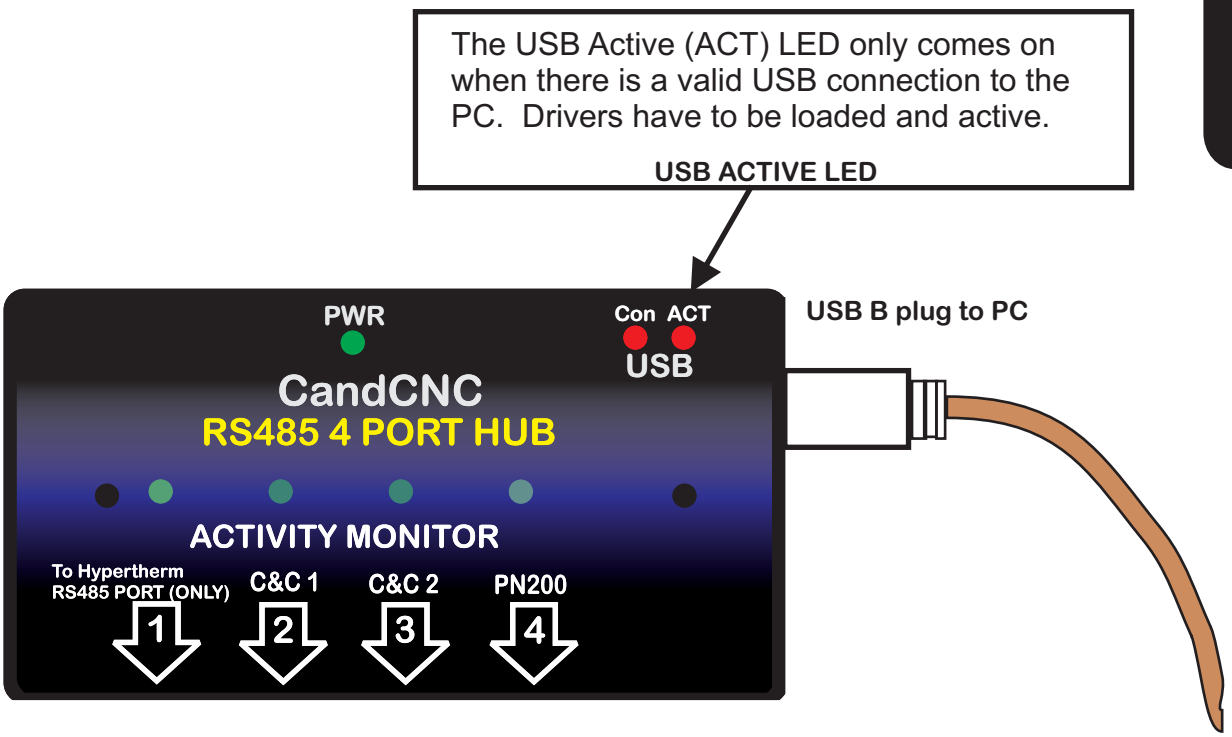
To EPO on ESP front panel or EPO on Table I/O

Standard CAT5 UTP up to 50ft

ACTIVITY MONITOR LEDS

When a device is plugged into a port on the hub the LED will light if it has proper communications. It does not mean the device is operating correctly (see later pages for using the Hub Utility). The Activity Monitor shows send and receive activity on the port

CandCNC DTHC IV (parallel port) system shown



INSTALLING CandCNC RS485 Devices to the USB-RS485 4 PORT HUB

The USB-RS485 4 PORT HUB has an advanced processor that can communicate with several RS485 devices. RS485 is a robust and noise-immune communications standard used in industrial electronics for years. Because of its differential signal methods it is unaffected by external or ground based noise and reliable communications of several hundred feet are common. RS485 is a multi-drop topology meaning there can be multiple devices on the same pair of wires as long as all of the devices operate at the same speed (BAUD RATE) and have a unique address. Since USB is a common port on most PC's it is a logical choice for communications that do not depend on precise timing.

You will note that the USB-RS485 4 Port Hub has four independent channels and each channel can talk to multiple devices, Because of different Baud Rates or special signals the 4 port hub has two special jacks:

1. **Hypertherm RS485 Port**. This channel runs at a much slower speed and can only talk to a Hypertherm Plasma Cutter equipped with an RS485 port (optional) and through our HyT-Connect RS485 interface. If you already have the HyT-Connect RS485 SIM Kit installed and have the older single port (dual jacks) RS485 module you need to unplug the existing setup and plug the RJ45 (Cat5) cable FROM the port on the rear of the Hypertherm into the jack 1 marked "To Hypertherm Rs485 PORT.

This page shows connection of the optional HYT-Connect RS485 SIM Kit. More detail can be found in the HyT-Connect RS485 SIM Manual. The RS485 option to control plasma cut current is part of the TAP product

Plugging RS485 Hypertherm into RS485 PORT on back of Hypertherm 65/85/105

See HyT-Connect Manual for details on installing and using the RS485 remote control for the Hypertherm and the DCC (Dynamic Cut Control).

2. **PN200 Hand Control.** The PN200 hand control uses normal high speed baud rates but the special “dead man” E-Stop to the EPO of any CandCNC controller requires a special jack. The PN200 MUST be plugged into the PN200 jack to be able to use the E-STOP safety (recommended). The PN200 has to be the last device in a group of devices. The PN200 will worked plugged into other jacks on the 4 PORT HUB (except JACK 1) but you cannot use the E-STOP option. You can also use the PN200 jack on the hub for other RS485 devices if you do not have a PN200. While the PN200 would work with other devices on the channel that have loop through (pass through) jacks the E-STOP to EPO DOES NOT PASS THROUGH OTHER DEVICES.

3. **DTHC IV High Speed Digital Torch Height Control**. The DTHC IV uses the RS485 (C3BUS) for the following:

- Transfer of screen information to MACH3 like Torch Volts, Torch Amps and the status LED’s for Torch UP, Torch DOWN and ARC OKAY. Unlike the DTHC II that uses defined parallel port inputs for the UP, DOWN and ARC OK, the DTHC IV sends the data across the RS485. The only “hard” input from the DTHC IV to MACH3 is the HOLD signal (mapped to INPUT 1 on Ports & Pins).
- Communication to the plug-in in MACH3 to update Z position when DTHC is active(tells MACH3 where the DTHC has moved the Z while under THC mode)
- Pass parameters and settings in MACH to the memory of the DTHC IV. This includes all of the DTHC Cut Profile Settings either from the screen or from the G-code when using DCC

C3BUS® MANAGING THE HUB

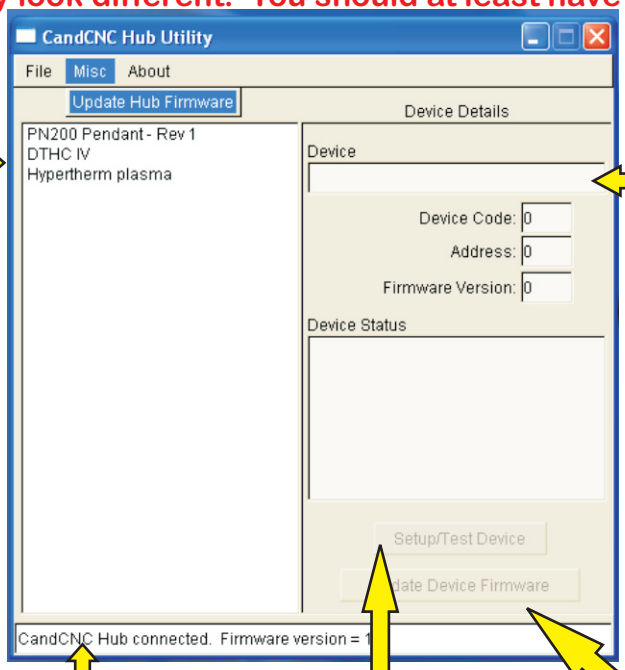
During the install the CandCNC Hub Utility was added and an ICON was placed on your desktop. Click on the icon to open the Hub Utility.

IMPORTANT: The purpose of the HUB UTILITY is primarily to confirm proper communication with each device and to be able to do some base level testing . **You cannot run the Hub Utility at the same time as MACH is running.**

The following screens show the CandCNC Hub Utility displaying information about different devices connected to it. The Hub is “smart” and automatically detects any compatible device connected to it. Review the screens that follow and understand what each section of the screen is used for.

C3 HUB MANAGEMENT
HUB UTILITY

Depending on the devices you have attached your Hub Admin may look different. You should at least have the DTHCiv Device



DEVICES:

Shows a list of connected devices. As a device is connected and sensed by the hub it will appear in the list. If you connect a device and it does not show up immediately, stop (close) the application and restart.

DEVICE DETAILS

Provides the:
Device Name
Device Code: Each CLASS (type) of device has a different Device CODE. Codes can be from 1 to 99.
Device Address: The unique address of a device within a class (values from 1 to 8). Devices of the same type must have a different Device Address. Future cards will have address jumpers to allow multiple cards of the same type to work on the same hub.
Firmware Version: This displays the current

Hub Connected
(to USB on PC)
Displays current firmware of the HUB. This MUST show connected status before any other of the functions will display.

TEST DEVICE
Action button that opens a new dialog window. You must have a device highlighted in the Devices List to use the Setup/Test Device

Update Device Firmware.
This allows you to update each module with new firmware. New firmware will be designated by a REV number. Firmware updates will be available for down load in a special download section of the CandCNC website and on the Yahoo CandCNCSupport Forum.

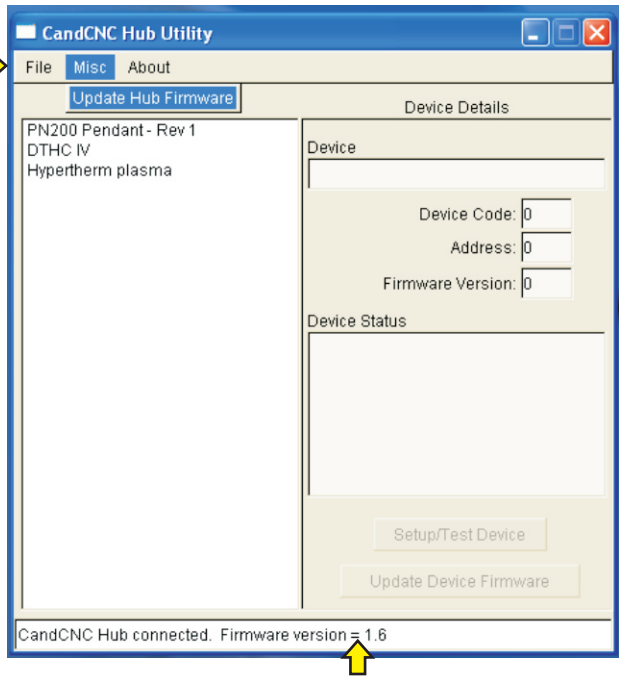
The Hub Utility is an application provided to manage the C3BUS USB to RS485 4 Port Hub and the devices attached to it. With the utility you can:

Update the Hub Firmware (Firmware is the program that runs the hub)
Update Firmware in the Devices attached (like the DTHC IV)
Test basic communications
Test device functions
Device level diagnostics
Tune the DTHCIV Z settings
Set some device settings

HUB MANAGMENT
HUB UTILITY

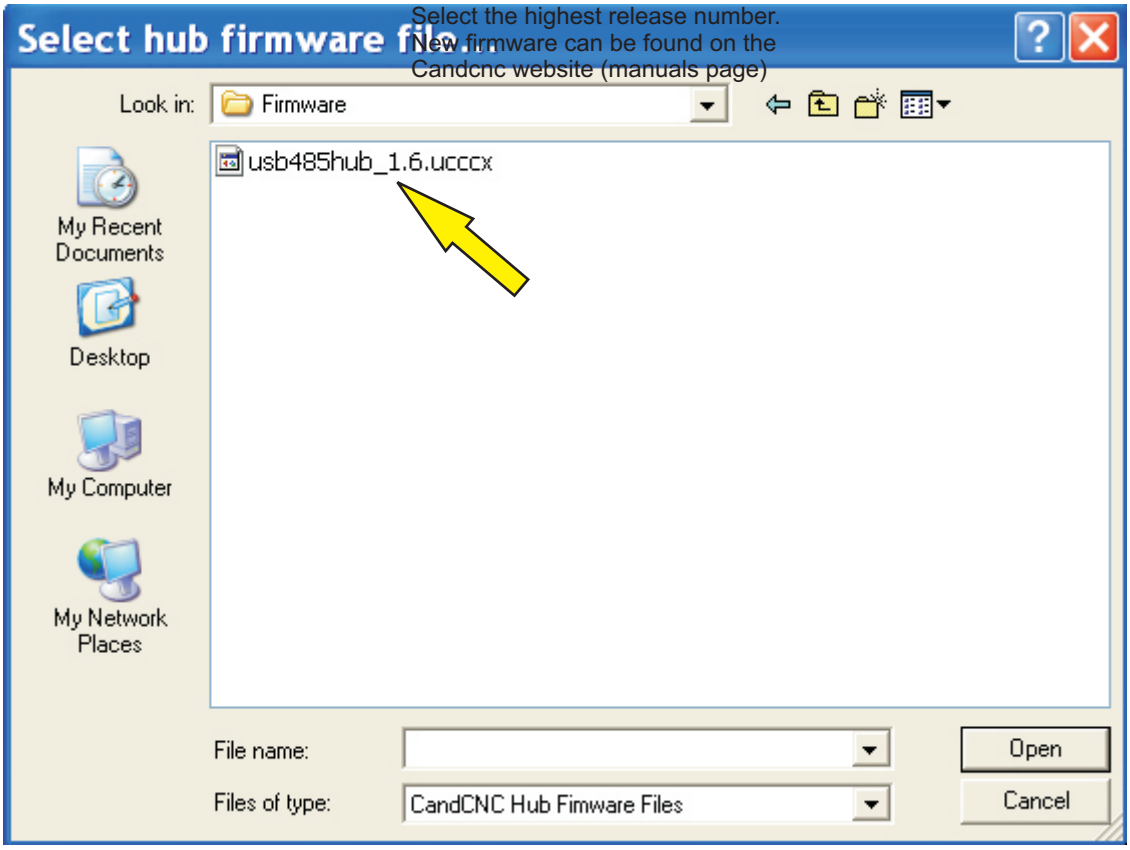
MISC:

Opens choice to update firmware. This is the first step in updating the HUB FIRMWARE.

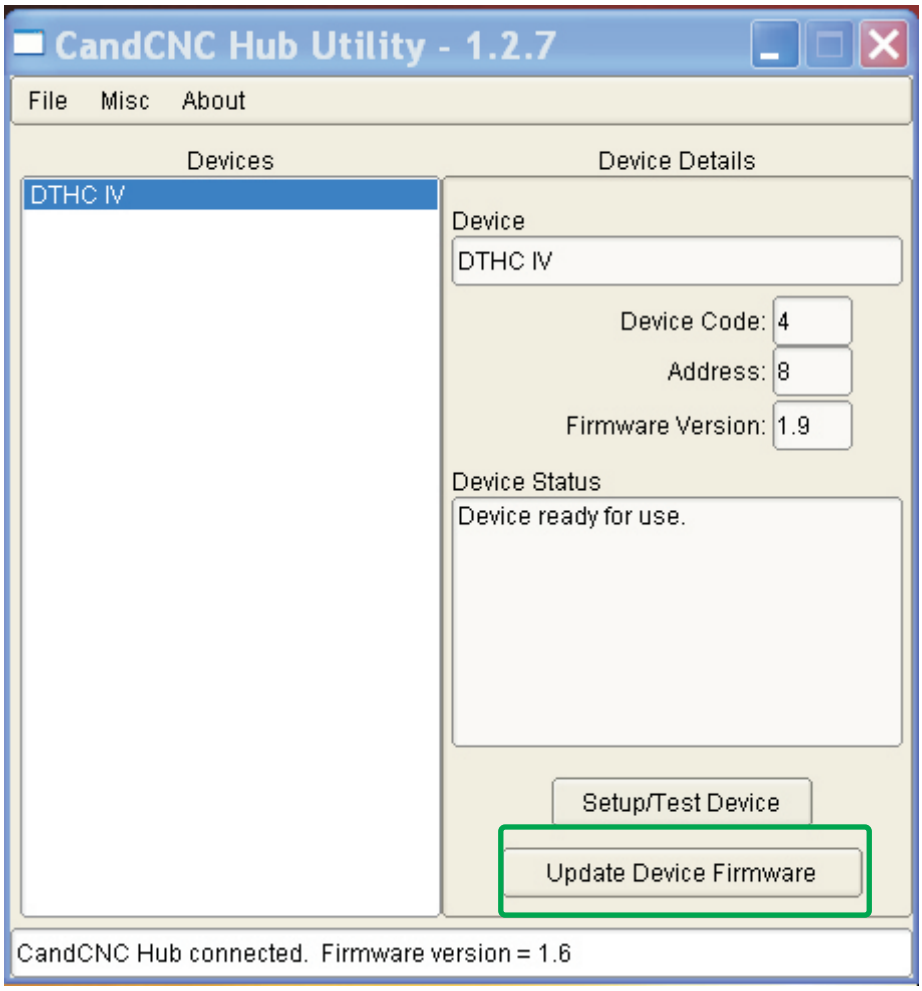


Current Firmware Version

Updating the HUB FIRMWARE is done from the MISC top menu and the *Update Hub Firmware* selection. It will open a File Explorer window and you should navigate to the USB-485HUB4/Firmware and select the highest REV number if the Current Firmware Version is the same as the highest it does not need updating

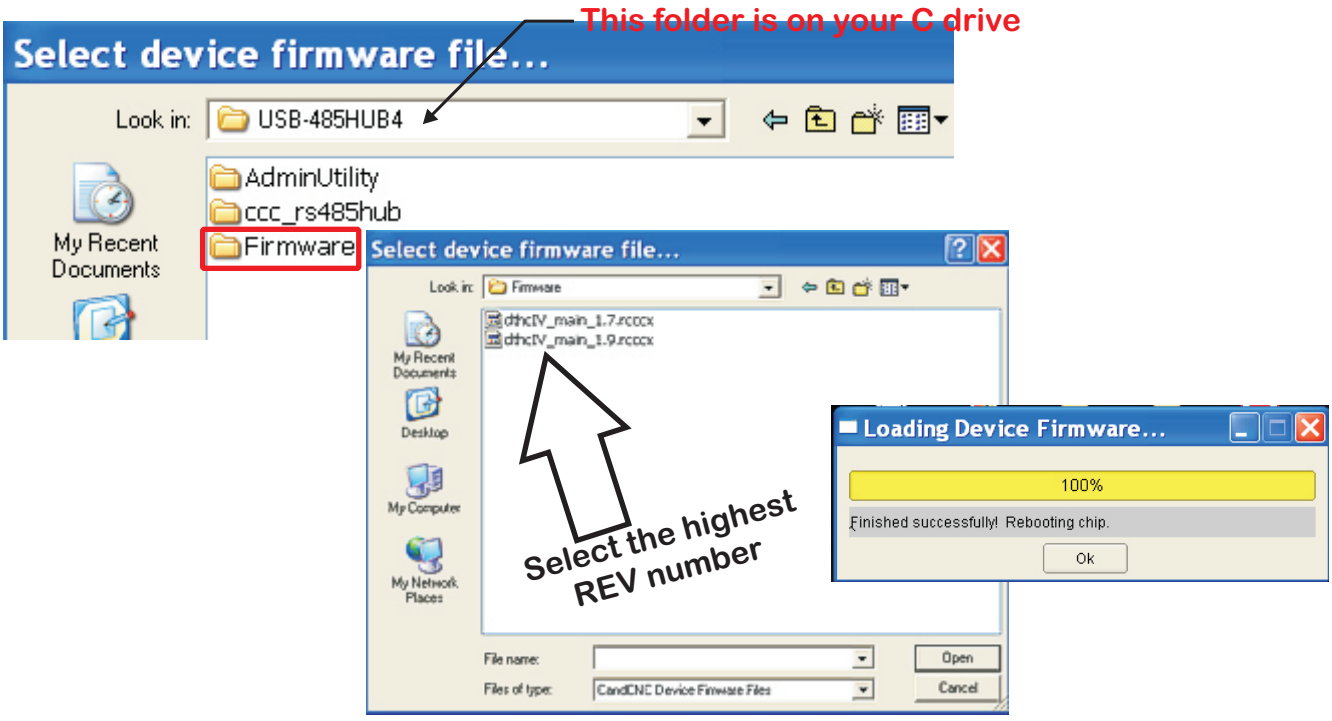


Select the highest release number. New firmware can be found on the Candcnc website (manuals page)



Updating a DEVICE Firmware is done by first selecting the device (Highlight with cursor) in the Devices List then hitting the ***Update Device Firmware*** button. You will get a File Explorer window. Navigate to the **USB-485HUB4/FIRMWARE** Folder on your C drive.

After an install or update you will see a list of Device firmware files . Select (left click) the one for the device and the highest REV number and hit the OPEN button. You will see a Loading Device Firmware window with a progress bar. When it says *Finished successfully* it will reboot the hub. Click OK and close Hub Admin and reopen it and the new device rev will be listed

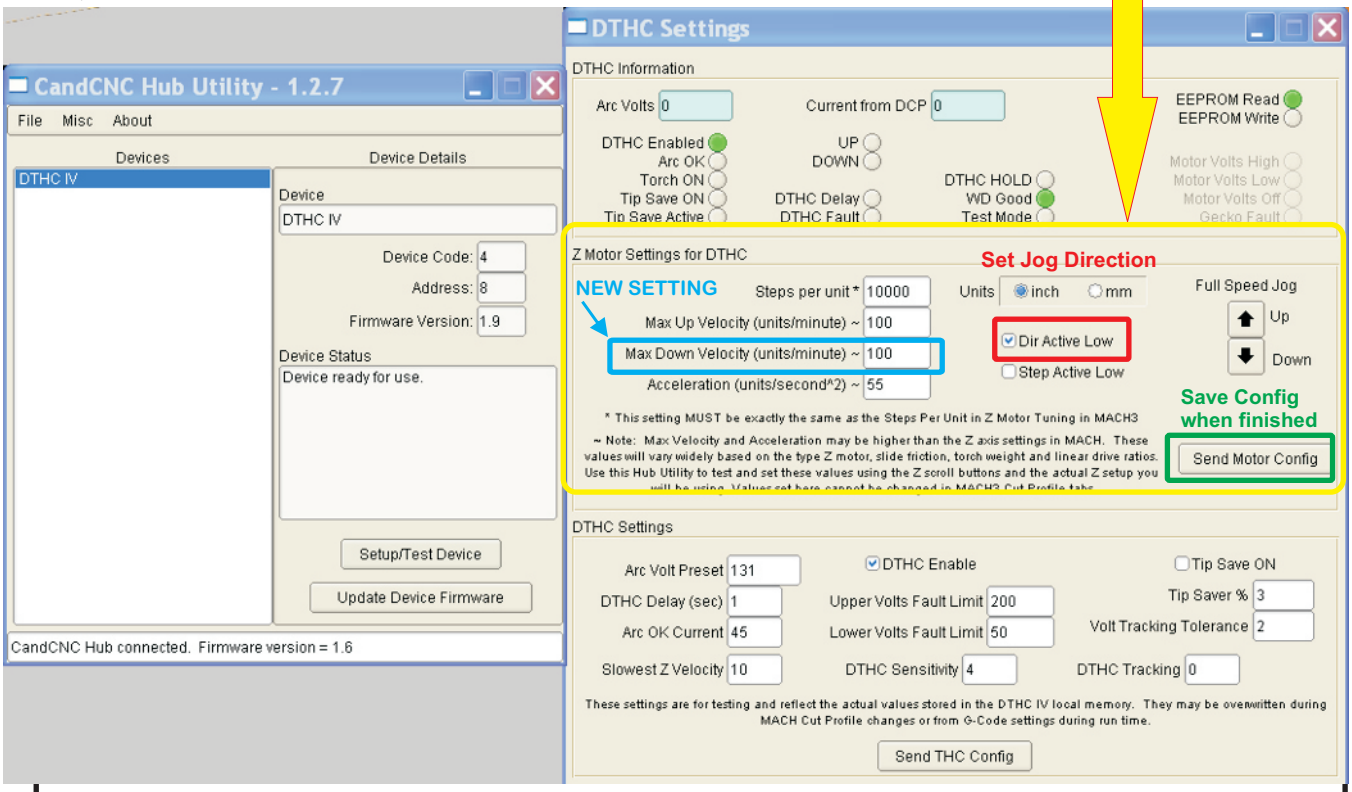


HUB MANAGMENT
HUB UTILITY

DTHC INFORMATION is direct feedback from the DTHC IV module and indicates the current status of the unit . You cannot make changes or do inputs from this section. Since you cannot run MACH and the Hub Utility at the same time these settings are primarily used for off-line diagnostics.

Z DTHC SETTINGS. **This section is the most important because it sets the base motor settings for the Z motor under DTHC control.** You will find that the Max Velocity and Acceleration *could* be much higher than your settings in MACH for the Z motor tuning. HOWEVER **we suggest that you set the velocity setting to the same as the value in the MACH Z motor tuning.** (about 100 to 120 IPM in this example) It has come to our attention that some Z's are simply not designed to move at the RPM required to get the higher speeds. It also makes initial setup and trouble shooting more difficult since everything moves and happens MUCH faster. The settings here are for a stepper system with a 620 oz-in motor running a 5 TPI leadscrew. Jog the Z UP and DOWN using the Full Speed Jog buttons on the screen. The motor should move smoothly **AND IN THE RIGHT DIRECTION**. The DIR Active Low is a checkbox that sets which direction the Z moves under DTHC control. If want to test at higher speeds , Move the settings up and test using the Z motion Jog buttons on the screen. The motor should move smoothly and rapidly both up and down. On loss of steps (or faults on a servo system) back the numbers off by 25%. They will effect the Gain and Tracking settings for the DTHC. Save any changes using the Send Motor Config Button

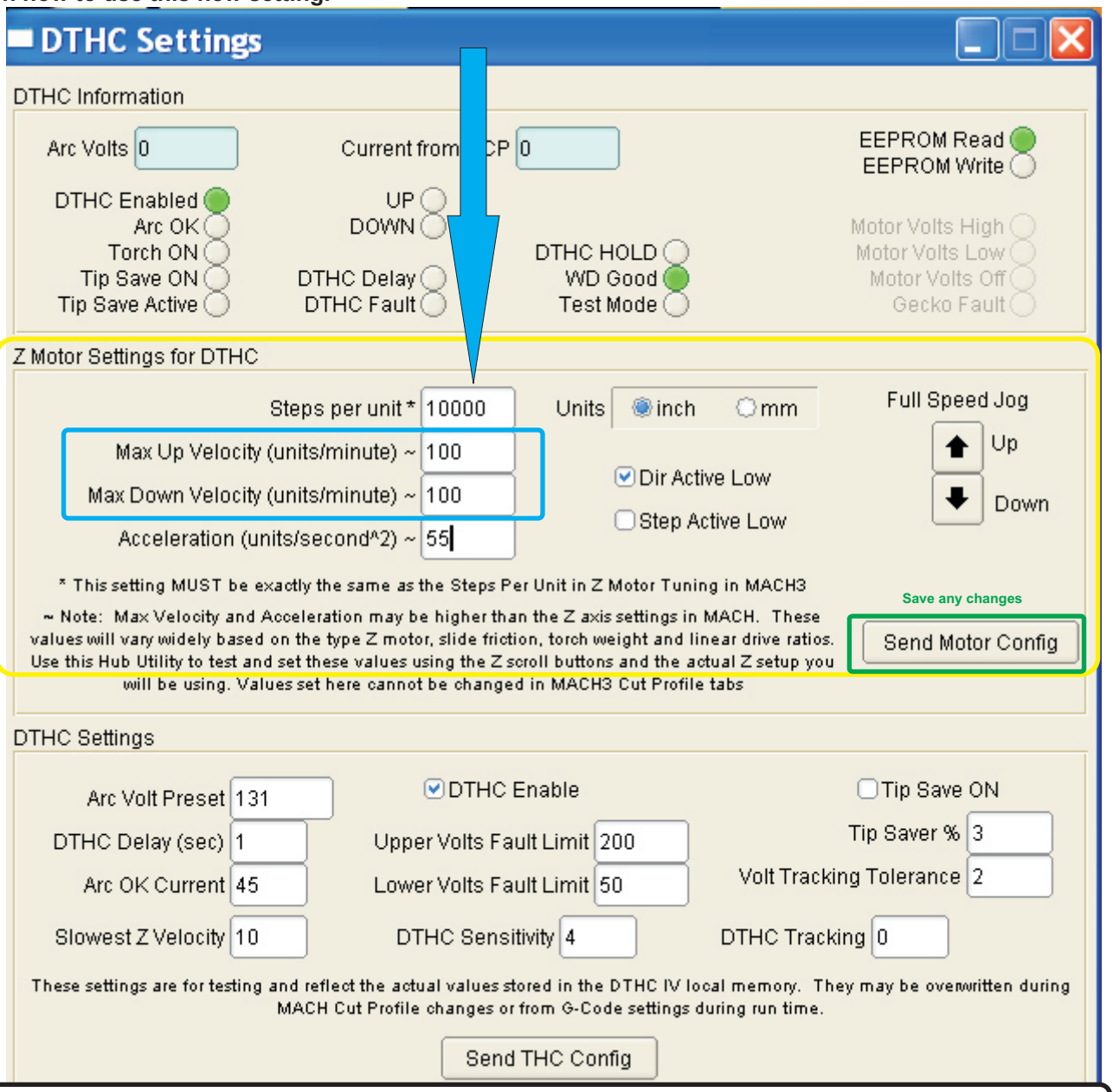
THIS IS THE ONLY PLACE TO SET THE Z TUNING FOR DTHC IV . A MINIMUM INSTALL REQUIRES YOU PREFORM THIS ONE FUNCTION IN THE HUB UTILITY.


CandCNC Hub Utility - 1.2.7
File Misc About
Devices
Device Details
DTHC IV
Device
DTHC IV
Device Code: 4
Address: 8
Firmware Version: 1.9
Device Status
Device ready for use.
Setup/Test Device
Update Device Firmware
CandCNC Hub connected. Firmware version = 1.6
DTHC Settings
DTHC Information
Arc Volts 0
Current from DCP 0
EEPROM Read
EEPROM Write
DTHC Enabled
Arc OK
Torch ON
Tip Save ON
Tip Save Active
UP
DOWN
DTHC Delay
DTHC Fault
DTHC HOLD
WD Good
Test Mode
Motor Volts High
Motor Volts Low
Motor Volts Off
Gecko Fault
Z Motor Settings for DTHC
Set Jog Direction
NEW SETTING
Steps per unit * 10000
Units inch mm
Max Up Velocity (units/minute) ~ 100
Max Down Velocity (units/minute) ~ 100
Acceleration (units/second^2) ~ 55
Dir Active Low
Step Active Low
Full Speed Jog
Up
Down
Save Config when finished
Send Motor Config
* This setting MUST be exactly the same as the Steps Per Unit in Z Motor Tuning in MACH3
~ Note: Max Velocity and Acceleration may be higher than the Z axis settings in MACH. These values will vary widely based on the type Z motor, slide friction, torch weight and linear drive ratios. Use this Hub Utility to test and set these values using the Z scroll buttons and the actual Z setup you
DTHC Settings
Arc Volt Preset 131
DTHC Enable
Tip Save ON
DTHC Delay (sec) 1
Upper Volts Fault Limit 200
Tip Saver % 3
Arc OK Current 45
Lower Volts Fault Limit 50
Volt Tracking Tolerance 2
Slowest Z Velocity 10
DTHC Sensitivity 4
DTHC Tracking 0
These settings are for testing and reflect the actual values stored in the DTHC IV local memory. They may be overwritten during MACH Cut Profile changes or from G-Code settings during run time.
Send THC Config

DTHC SETTINGS. These are the same as using the CUT PROFILE when MACH is running and serve to be able to test the RS485 communication to/from the DTHC IV and to test the DTHC IV memory and interface. In normal cutting these settings are provided by the Cut Profile and/or the DCC values from the G-Code at run-time. The Cut Profile in MACH now allows multiple levels of settings and is a better place to do the setup and testing under MACH.

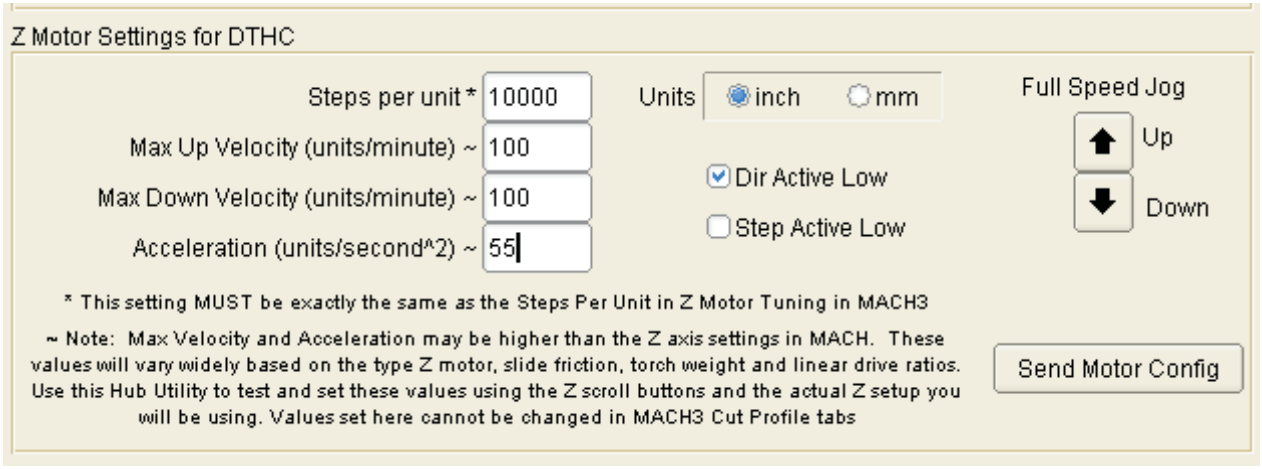
Z axis tuning for proper operation:

The Z motor Settings in this section determine the base settings of the Z axis WHEN THE DTHC IV (not MACH) IS MOVING THE MOTOR. When the Z is being moved by MACH from G-Code it uses the tuning set in the MACH3/Config/Motor Tuning for Z. When it is under control of the DTHC it uses the values in this section. Essentially you have two "controls" sharing the same motor but using their own rules. **The one setting that MUST be the same is the Steps per Unit. NOTE NEW IN DTHCIV FIRMWARE REV1.9 THE MAX UP VELOCITY and MAX DOWN VELOCITY ARE NOW SEPARATE SETTINGS See next page on how to use this new setting.**


DTHC Settings
DTHC Information
Arc Volts 0
Current from CP 0
EEPROM Read
EEPROM Write
DTHC Enabled
Arc OK
Torch ON
Tip Save ON
Tip Save Active
UP
DOWN
DTHC Delay
DTHC Fault
DTHC HOLD
WD Good
Test Mode
Motor Volts High
Motor Volts Low
Motor Volts Off
Gecko Fault
Z Motor Settings for DTHC
Steps per unit * 10000
Units inch mm
Full Speed Jog
Max Up Velocity (units/minute) ~ 100
Max Down Velocity (units/minute) ~ 100
Acceleration (units/second^2) ~ 55
Dir Active Low
Step Active Low
Up
Down
* This setting MUST be exactly the same as the Steps Per Unit in Z Motor Tuning in MACH3
~ Note: Max Velocity and Acceleration may be higher than the Z axis settings in MACH. These values will vary widely based on the type Z motor, slide friction, torch weight and linear drive ratios. Use this Hub Utility to test and set these values using the Z scroll buttons and the actual Z setup you will be using. Values set here cannot be changed in MACH3 Cut Profile tabs
Save any changes
Send Motor Config
DTHC Settings
Arc Volt Preset 131
DTHC Enable
Tip Save ON
DTHC Delay (sec) 1
Upper Volts Fault Limit 200
Tip Saver % 3
Arc OK Current 45
Lower Volts Fault Limit 50
Volt Tracking Tolerance 2
Slowest Z Velocity 10
DTHC Sensitivity 4
DTHC Tracking 0
These settings are for testing and reflect the actual values stored in the DTHC IV local memory. They may be overwritten during MACH Cut Profile changes or from G-Code settings during run time.
Send THC Config

The other parameters are set by starting out with the same velocity and acceleration as the Z motor tuning in MACH3 and using the Full Speed Jog Up and Down buttons to test the Z motion under DTHC control. **NOTE: If your motion is opposite the buttons, change the setting of the Dir Active Low checkbox**. **Failure to do this will cause the DTHC to do really wild motion in the opposite direct as it should. For initial setup and testing you should keep the Velocity and Acceleration settings for the DTHC low. In most circumstances these settings will work well on cutting flat stock with normal warping. Later** You can raise the velocity and acceleration to increase performance for cutting really thin material or corrugated.

THIS SECTION OF THE HUB ADMIN DTHC SETUP IS THE MOST IMPORTANT to get acceptable DTHC action during a cut.


Z Motor Settings for DTHC
Steps per unit * 10000
Max Up Velocity (units/minute) ~ 100
Max Down Velocity (units/minute) ~ 100
Acceleration (units/second^2) ~ 55
Units inch mm
Dir Active Low
Step Active Low
Full Speed Jog
Up
Down
* This setting MUST be exactly the same as the Steps Per Unit in Z Motor Tuning in MACH3
~ Note: Max Velocity and Acceleration may be higher than the Z axis settings in MACH. These values will vary widely based on the type Z motor, slide friction, torch weight and linear drive ratios. Use this Hub Utility to test and set these values using the Z scroll buttons and the actual Z setup you will be using. Values set here cannot be changed in MACH3 Cut Profile tabs
Send Motor Config

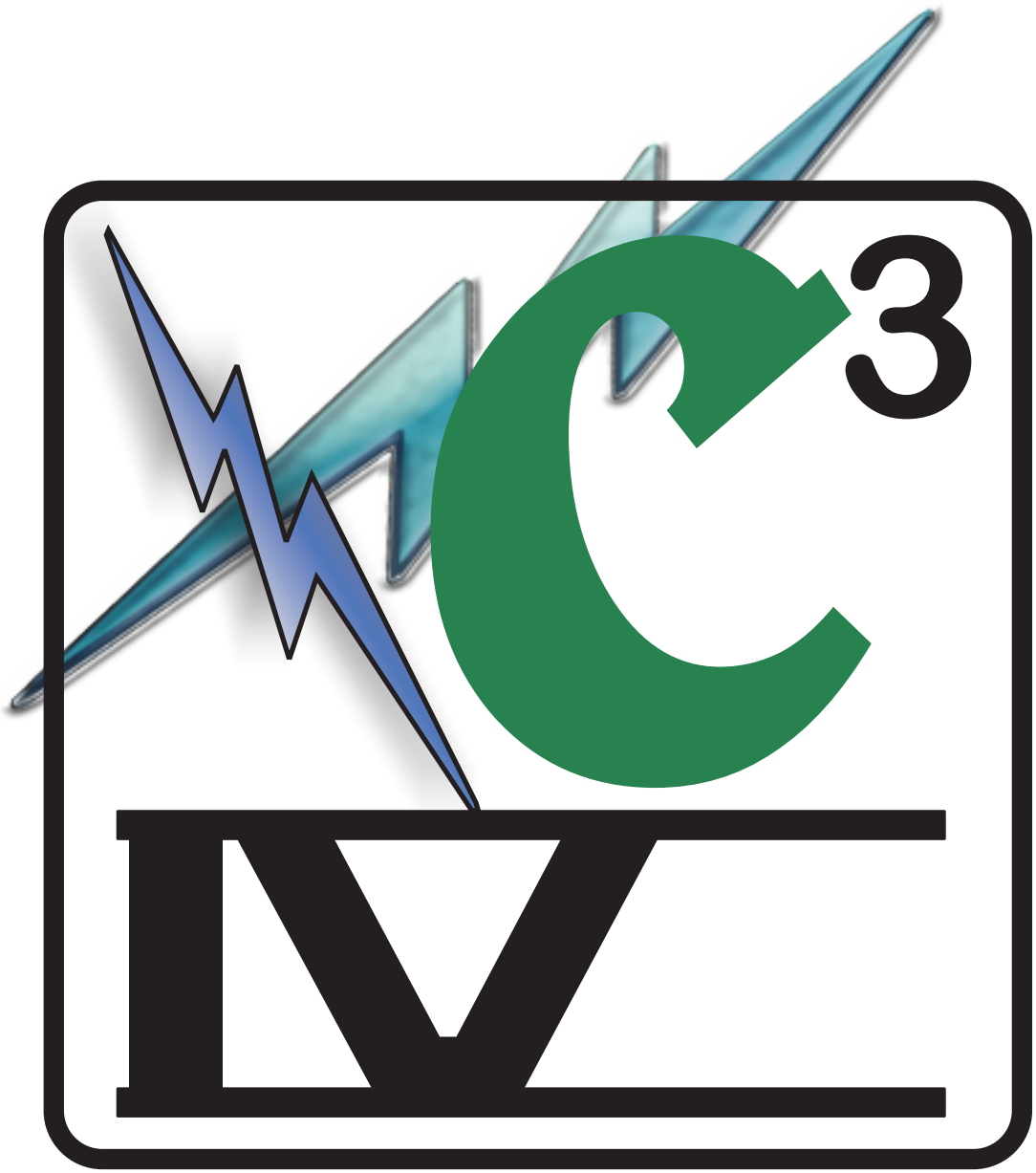
In the previous pages the settings that effect Z motion under DTHC control have been listed. IT IS IMPORTANT to understand that the motor tuning in MACH APPLIES TO NORMAL Z MOVES WHEN THE **DTHC IS NOT ACTIVE**. This is anytime it is turned off in the screen or from the G-code. All moves for touch-off , pierce height and plunge to Cut Height, are handled by G-Code and MACH vai normal Motor tuning. THE SETTINGS ABOVE ARE ONLY USED WHEN THE DTHC IS ENABLED. ACTIVE AND NOT IN A DTHC DELAY PERIOD. That would be after the torch fires and after the code enables the DTHC (usually when the torch reaches the Cut Height) AND the DTHC is turned on in code AND after the DTHC delay time. TUNING IN THE SCREEN ABOVE ONLY EFFECTS HOW THE Z MOVES (even which direction) when the DTHC has control of the ttorch axis (Z)

ABOUT THE MAX VELOCITY UP and the MAX VELOCITY DOWN.

in prior versions of the firmware and utility before REV 1.9 you only had the choice of *Max velocity* for Z along with *Acceleration* and the *Steps per Unit*. In this version we have split the UP velocity and DOWN velocity into two separate settings. This allows you to better tune the motion of the DTHC. Cutting most sheet and plate material it is generally better to have a FAST UP and a SLOWER DOWN response. It helps with voltage spikes that sometimes happen wile cutting, changing direction or slowing down. The exception to this would be if you are cutting corrugated or perhaps diamond plate where both up and down need to be fast. If your DTHC is cutting good with the old settings just make UP and DOWN the same speed. If you have occasional torch dives during a cut (after the pierce and DTHC Delay time) you should move the DOWN velocity to ½ the Up velocity as a test. even as low as 20% of the UP velocity might be used on some material.

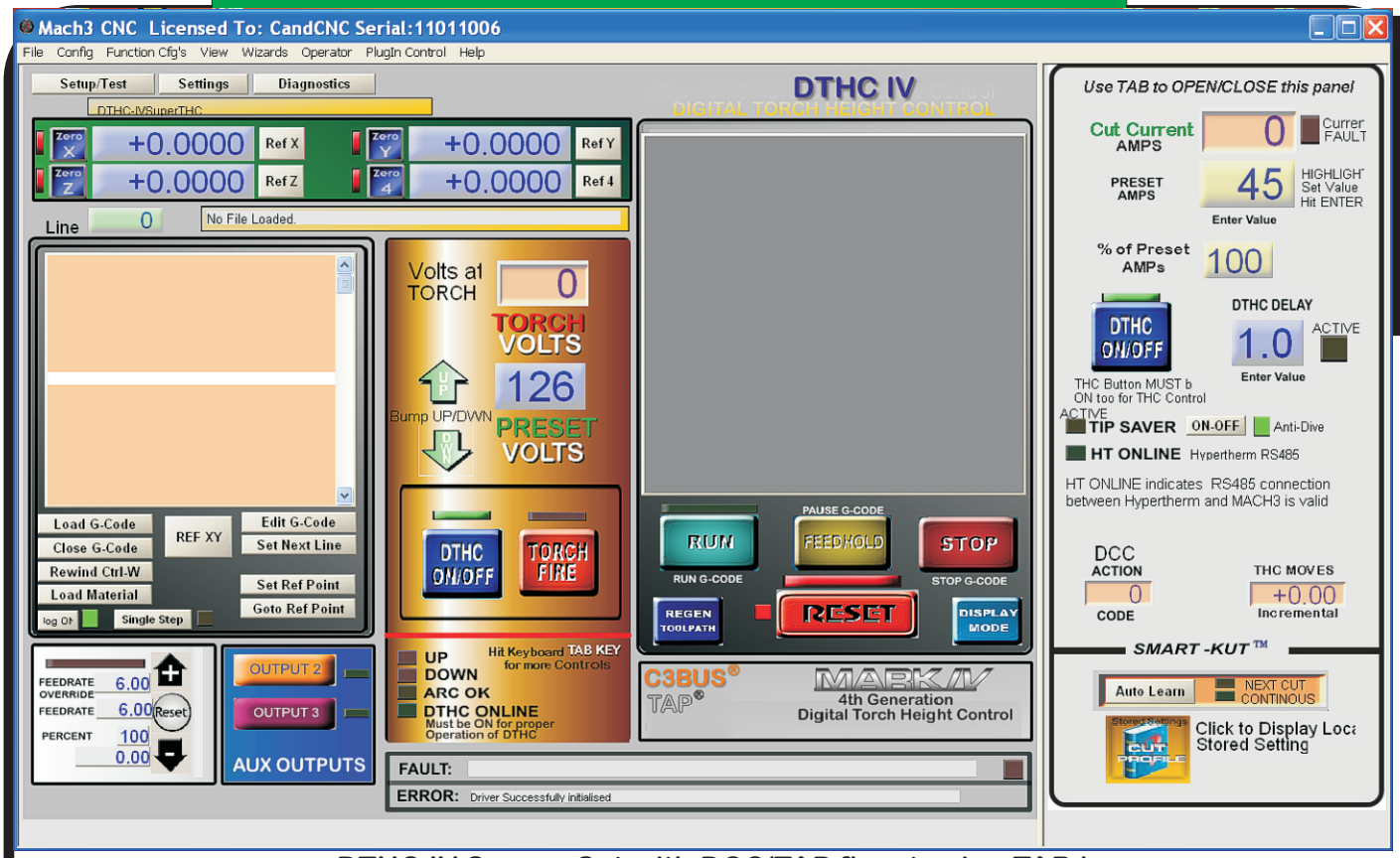
SETTING UP ETHERNET COMMUNICATIONS

NOTE to BladeRunner Ether-Cut owners. The BladeRunner Ether-Cut User manual has this setup for the Ethernet. You can skip this section .



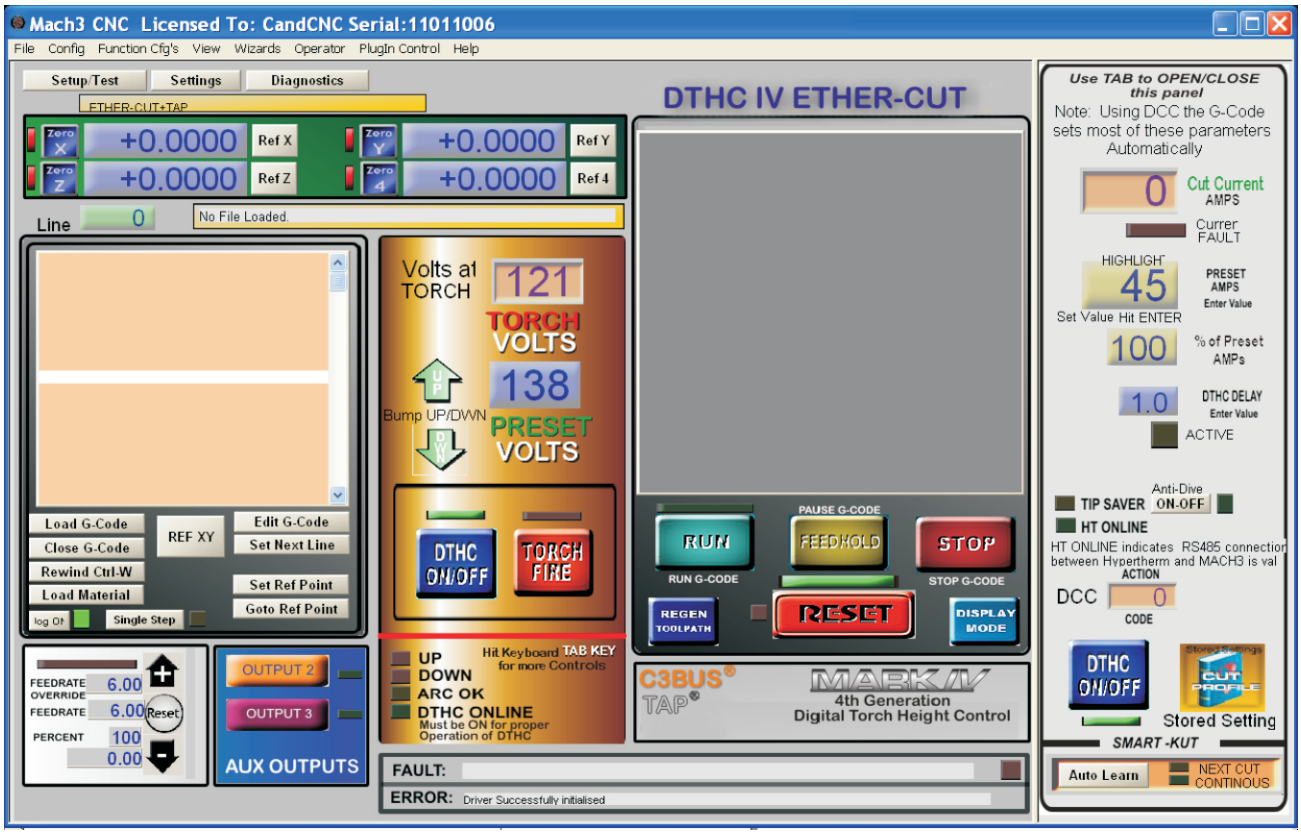
NOTE to BladeRunner Ether-Cut owners. The BladeRunner Ether-Cut User manual has this setup for the Ethernet. You can skip this section .

MACH SCREENS FOR DTHC IV & ETHERCUT

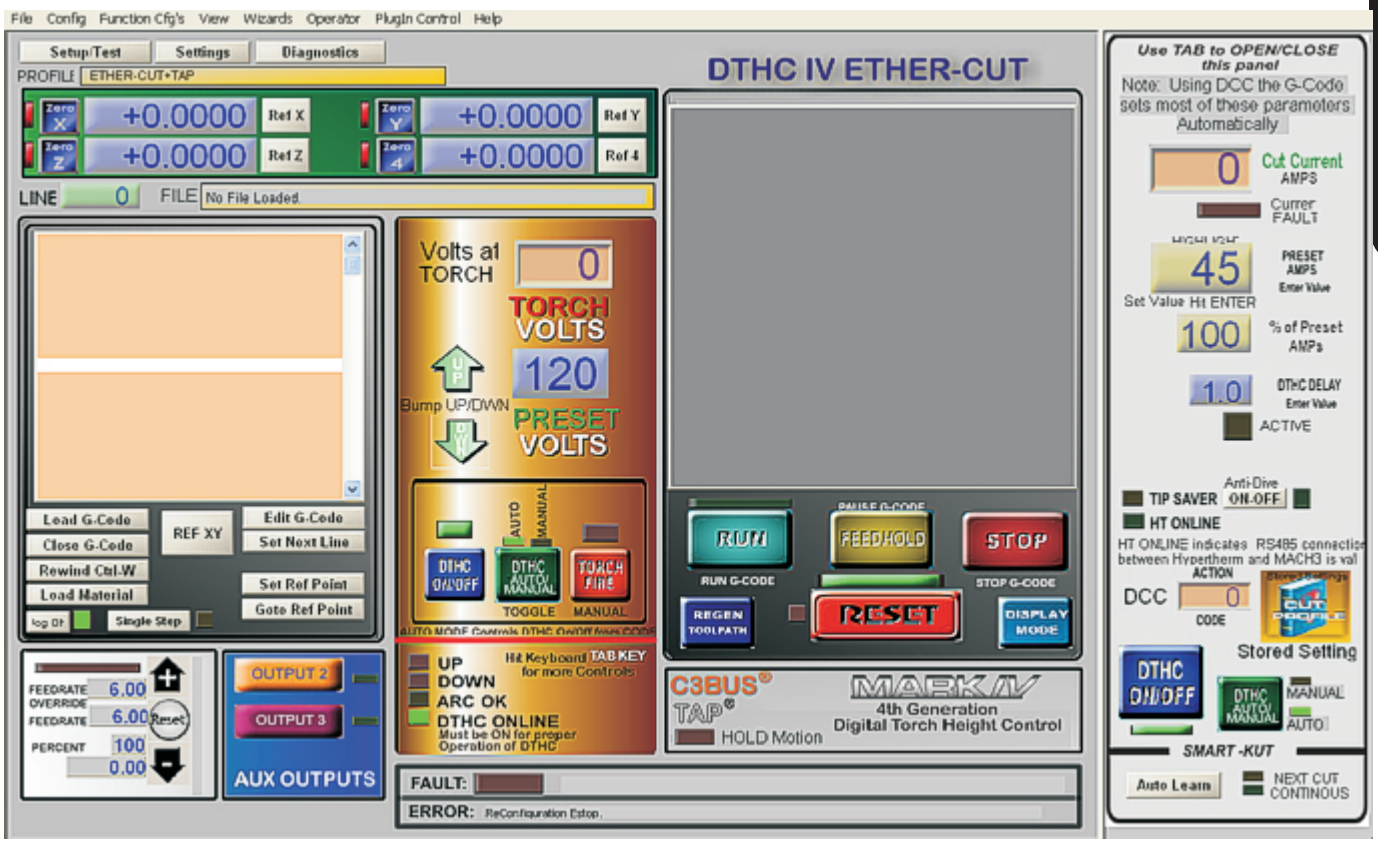


DTHC IV Screen Set with DCC/TAP flyout using TAB key

NOTE: Screens change as we upgrade certain features and your screen may not look *exactly* like this one but it should be similar.

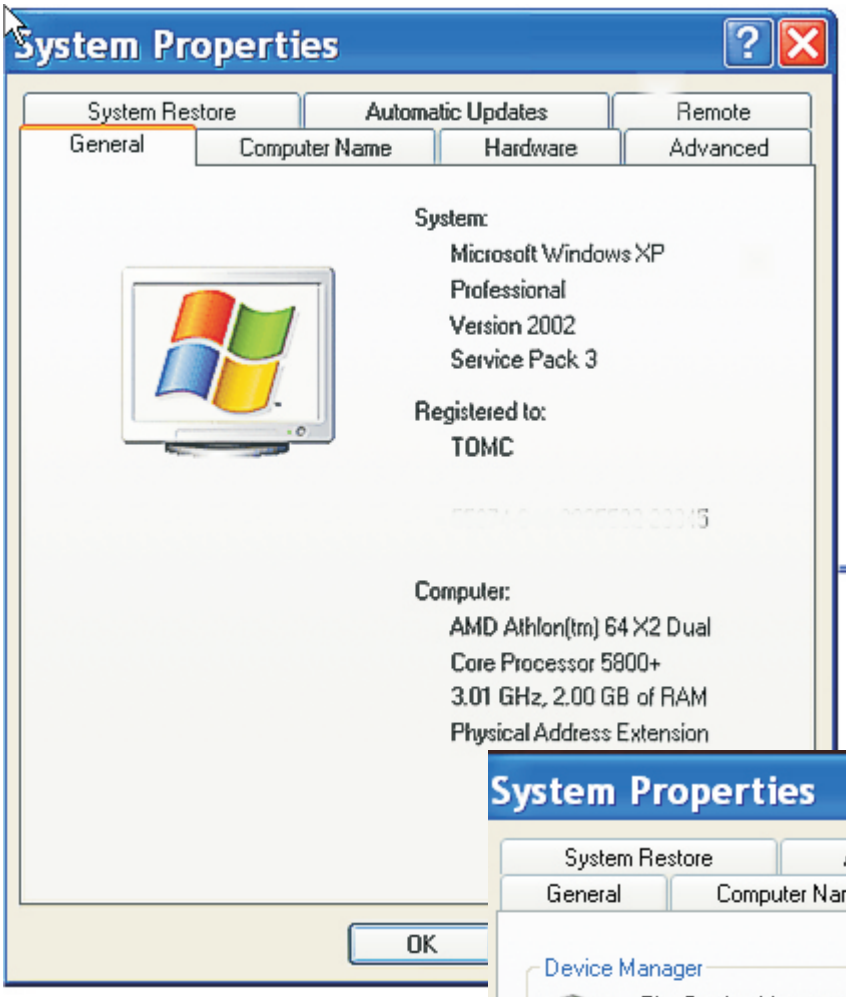


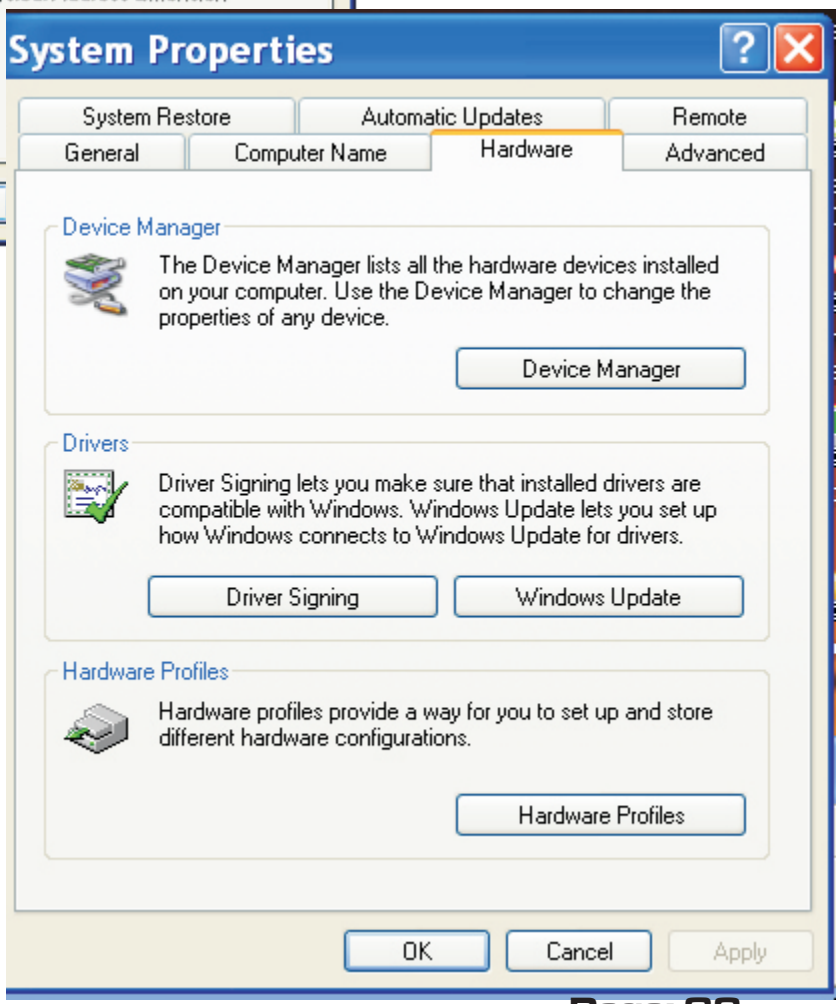
DTHC IV + Ether-Cut Screen Set with DCC/TAP fly-out using TAB key



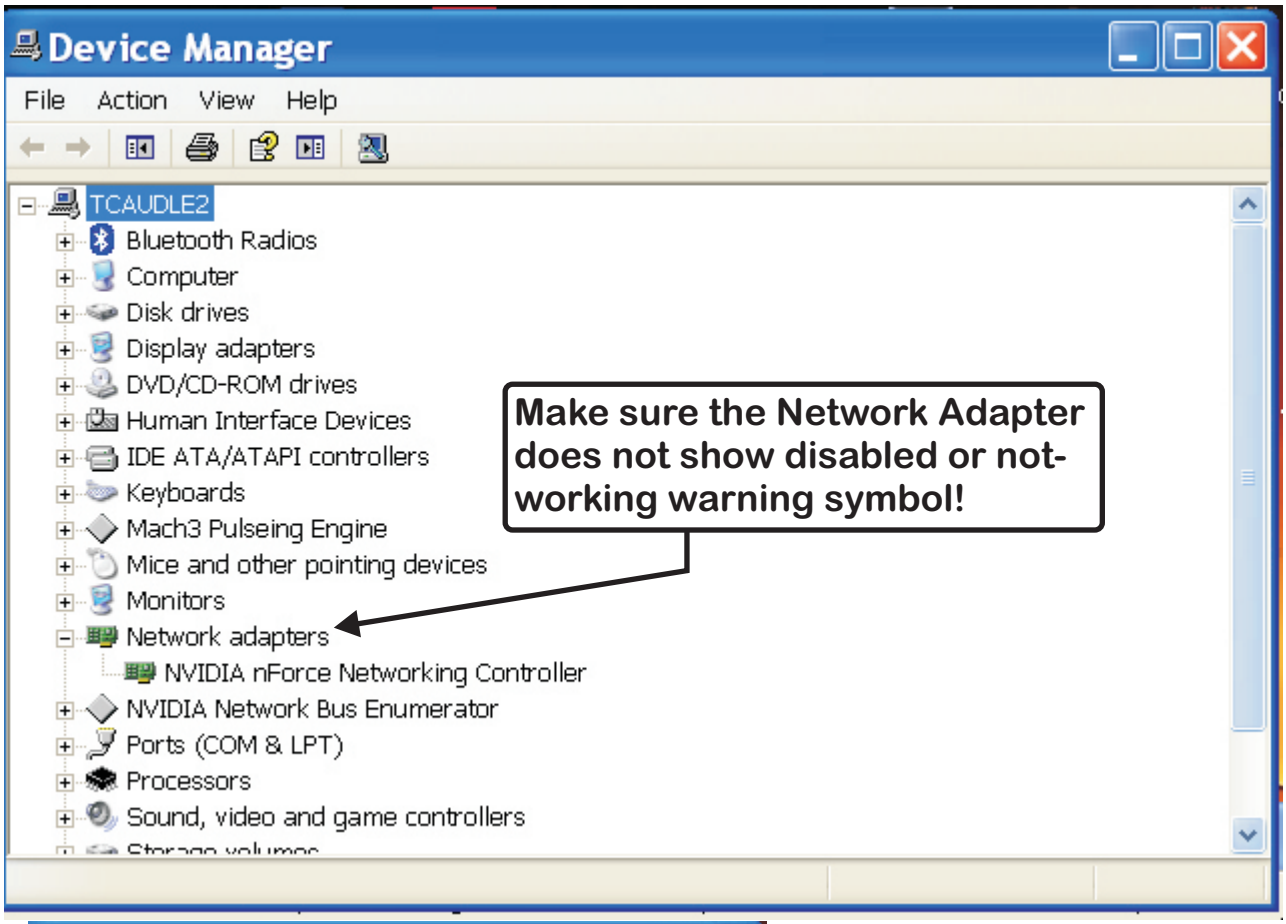
Notice that this is a later screen set that adds a new button named DTHC Auto Manual. It allows the operator to override any automatic DTHC ON or OFF commands in the Cut Profile or from the G-Code. To override click the button so that the MANUAL Led above the button is ON and then click the DTHC ON/OFF button to either turn the DTHC ON or OFF. **This mode is handy if you are doing the initial setup and testing of the DTHCIV and need to do a test cut with the DTHC disabled to get baseline numbers. If you do not have this screen you can get it and the updated drivers and associated files from the CandCNC**

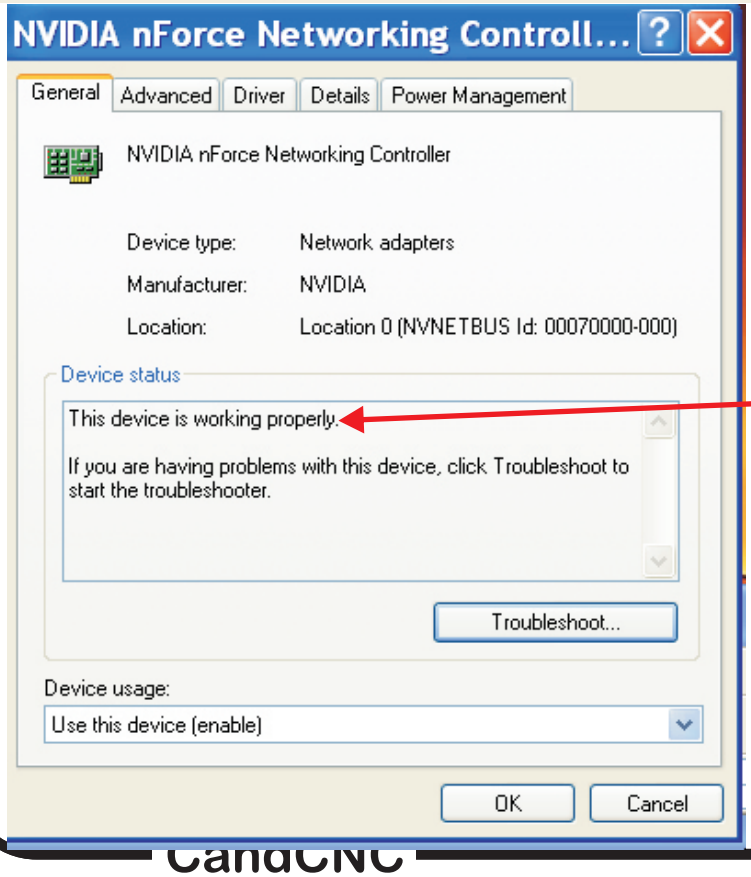
SETTING UP THE ETHERNET PORT FOR ETHER-CUT (Windows XP)




System Properties
System Restore
Automatic Updates
Remote
General
Computer Name
Hardware
Advanced
Device Manager
The Device Manager lists all the hardware devices installed on your computer. Use the Device Manager to change the properties of any device.
Device Manager
Drivers
Driver Signing lets you make sure that installed drivers are compatible with Windows. Windows Update lets you set up how Windows connects to Windows Update for drivers.
Driver Signing
Windows Update
Hardware Profiles
Hardware profiles provide a way for you to set up and store different hardware configurations.
Hardware Profiles
OK
Cancel
Apply

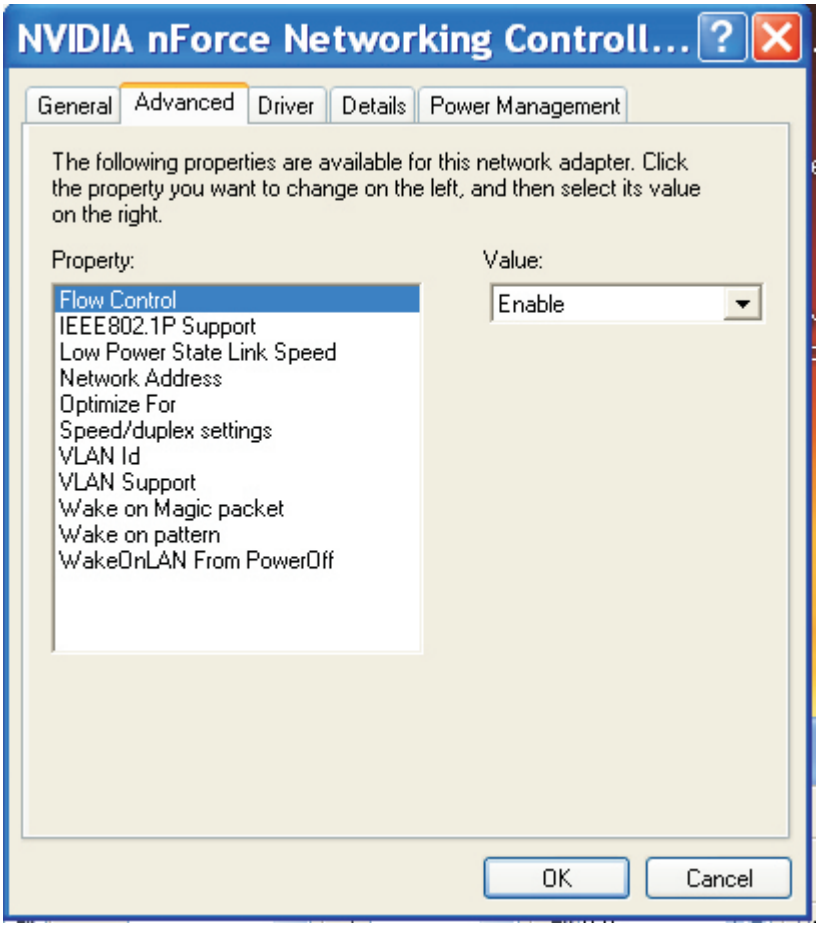
SETTING UP THE ETHERNET PORT FOR ETHER-CUT (WIN XP)





This does not mean the device is actually “working” and will talk to a network or the Ether-Cut. It simply means Windows sees the device and it appears the right drivers are loaded. If you have problems configuring or testing the port it can still be a bad Ethernet card or the wrong card drivers.

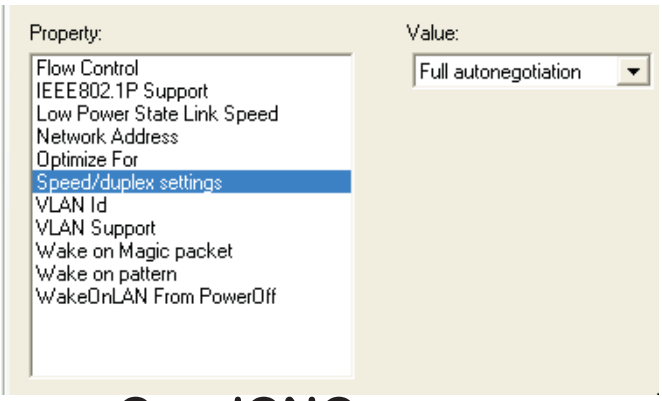
SETTING UP THE ETHERNET PORT FOR ETHER-CUT (WIN XP)

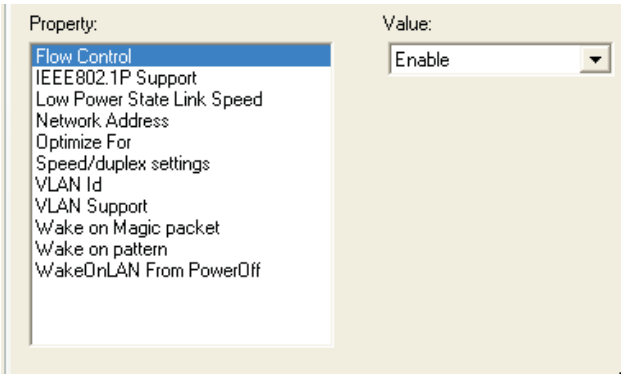


NOTE the screens shown are for an NVIDIA Network card and may have different option screens and settings. Most cards have default settings that are correct and do not need to be changed.

NVIDIA nForce Networking Controll...
General
Advanced
Driver
Details
Power Management
NVIDIA nForce Networking Controller
Allow the computer to turn off this device to save power.
Allow this device to bring the computer out of standby.
Only allow management stations to bring the computer out of standby.

When running MACH3 on a computer you MUST turn off all Power Saving options in Windows and make sure the communications device is not set to turn off to save power. This option may not appear on all Ethernet Cards.

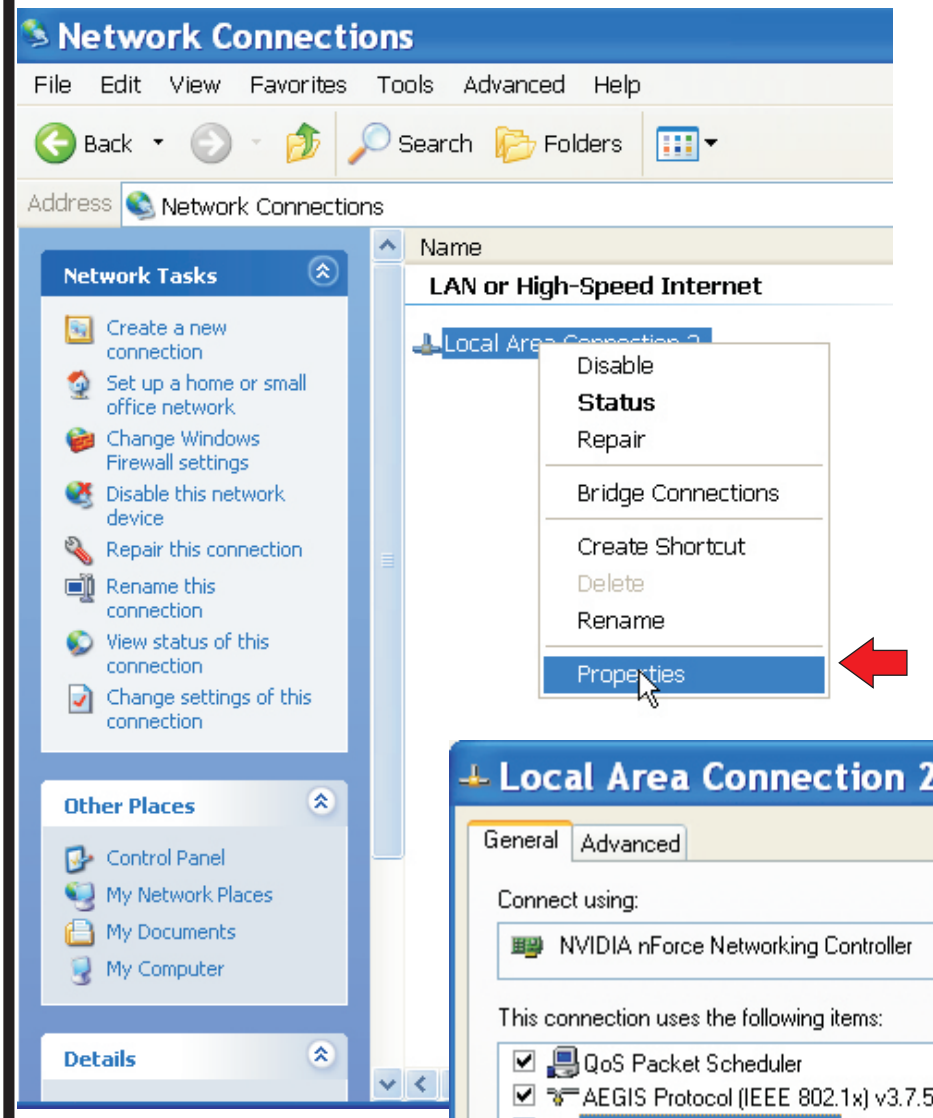




SETTING UP THE ETHERNET PORT FOR ETHER-CUT (WIN XP)

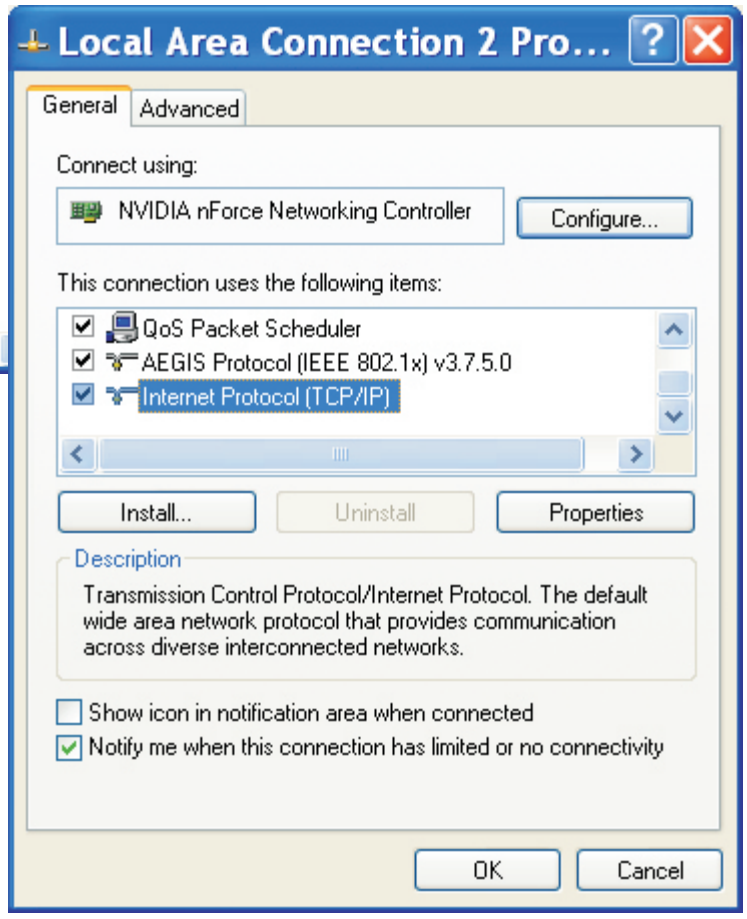
Make sure the Local Area Connector does not show it is **disabled**. It may show it is not CONNECTED but if it is missing or disabled you will need to get the problem resolved before you can proceed with the install.

SETTING UP THE ETHERNET PORT FOR ETHER-CUT (WIN XP)



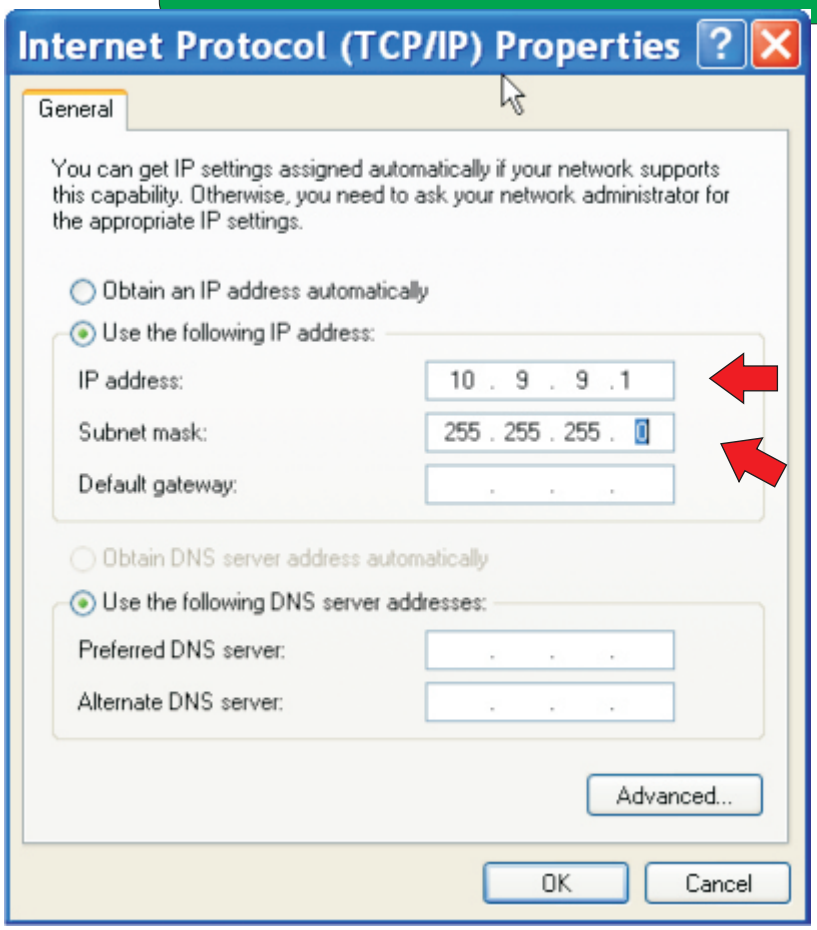
Find the Local Area network (there may be wireless networks shown too). Ether-Cut needs a DEDICATED network connection from the ethernet port on the PC directly to the Ether-Cut connector.

Right click and select PROPERTIES from the List Box. The Properties window will display.



Scroll to the Internet Protocol device and hit the PROPERTIES button.

SETTING UP THE ETHERNET PORT FOR ETHER-CUT (WIN XP)


Internet Protocol (TCP/IP) Properties
General
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Obtain an IP address automatically
Use the following IP address:
IP address: 10 . 9 . 9 . 1
Subnet mask: 255 . 255 . 255 . 0
Default gateway:
Obtain DNS server address automatically
Use the following DNS server addresses:
Preferred DNS server:
Alternate DNS server:
Advanced...
OK
Cancel

The TCP/IP Properties window will appear.
Make the following changes:

Select “Use the following IP Address”

Type in the IP address exactly as shown (10.9.9.1)

Type in the Subnet mask exactly as shown (255.255.255.0)

Do not assign a Default Gateway (blank)

Do not assign any DNS servers (blank)

Do not use the Advanced button.

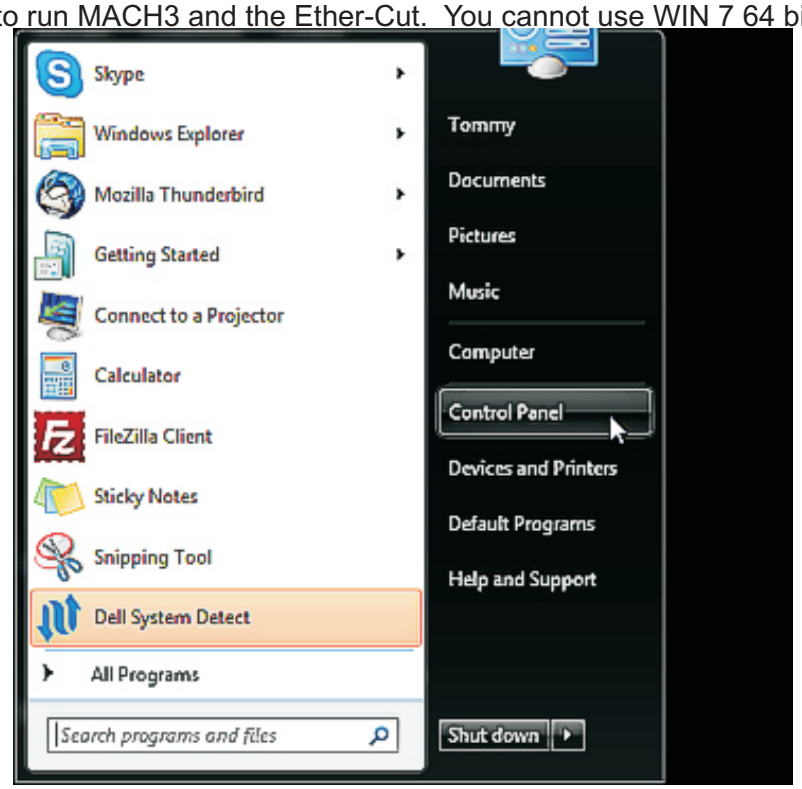
A NOTE ABOUT THE TCP/IP Address and the Ether-Cut

The Ether-Cut uses a modified version of the ESS Smooth Stepper™ and the manual for that product should NOT be used for this installation. We have all of the settings (including the IP address of the ESS card) preset and tested at the factory as part of the final system tests we do on all our products. **The address of the ESS is 10.9.9.9. It is STRONGLY advised that you DO NOT run this through a hub or have it on a network with other devices.** If you need network or wireless connectivity you need to install another NIC or wireless device, and set that up separately with it’s own address and settings. You can run multiple Ethernet cards in the same computer. For the Ether-Cut setup, there is NOTHING you need to change or setup other than the Ethernet port on your control PC. If you cannot get the proper indications or the ping response on the tests and have done all of the CandCNC Ether-Cut installation, than it is most likely a PC related hardware problem. A lot of PC’s (Dells in particular) from refurbishers or that have been used with the parallel port version, may have the Ethernet disabled or may not have the proper drivers loaded. We have found that if you load the wrong driver you may get an indication in the Device Manager the Ethernet card is OK but it still won’t communicate. Windows does no testing for functionality of ANY device. It just confirms it is there. If you cannot get your Ethernet port to function properly then you should check and see if there are driver updates for your PC and the Ethernet Card you have.

SETTING UP THE ETHERNET PORT FOR ETHER-CUT (WIN 7)

The procedure for setting up the Ethenet address and settings on Windows 7 for the Ether-Cut are very similar to those for Windows XP shown in the previous pages. The process of getting to the Network Connections is a little different.

A NOTE ABOUT USING WIN 7 with MACH3. **You must use a 32 bit version of Windows 7** to run MACH3 and the Ether-Cut. You cannot use WIN 7 64 bit running in 32 bit emulation.

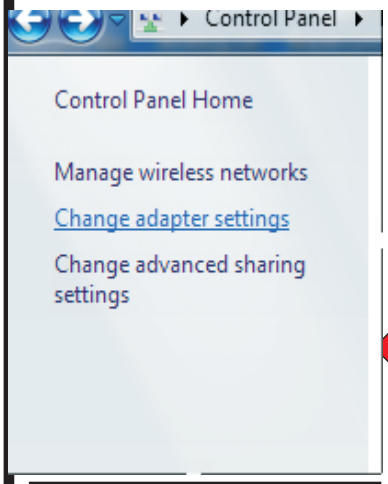


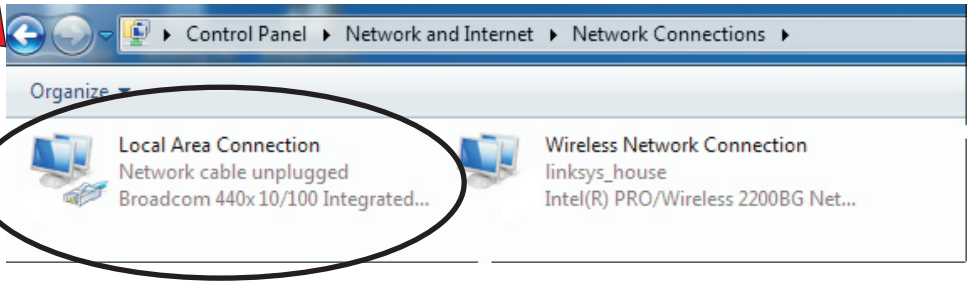
Select Control Panel from Start Menu.

Select Network and Sharing Center from the Control Panel Full Menu.

You will get a graphical representation of your network and installed links.

On the left you will see the Change Adapter Settings menu choice.

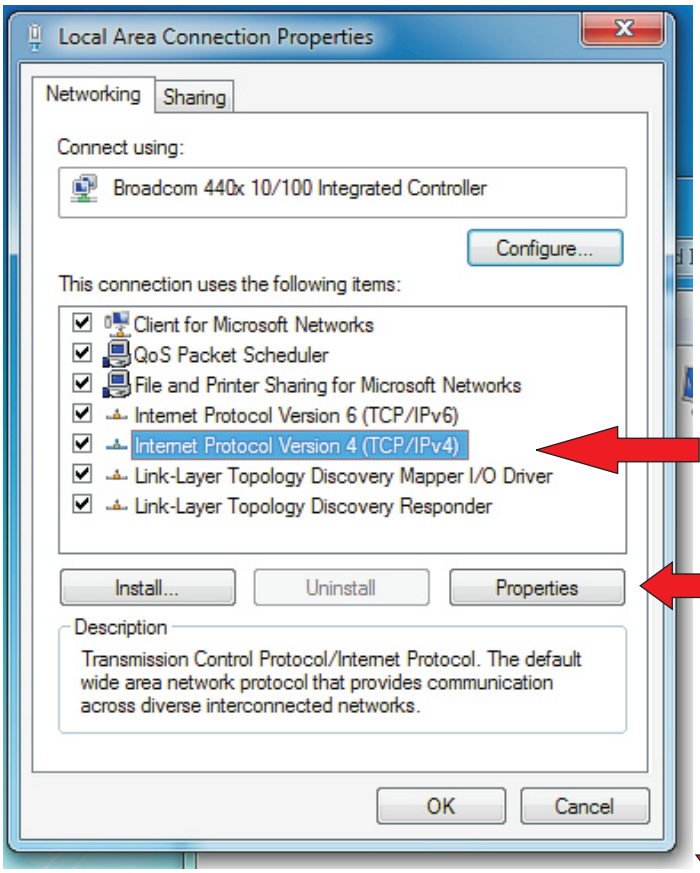




Right click and select **Properties**

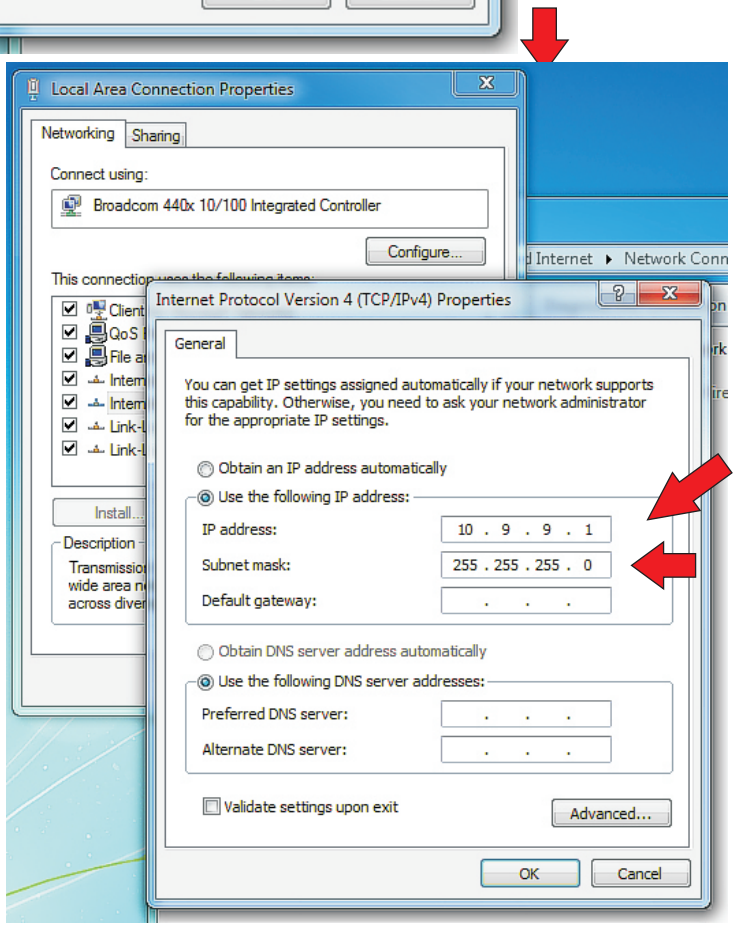
Make sure the Local Area Connector does not show it is disabled. It may show it is not CONNECTED but if it is missing or disabled you will need to get the problem resolved before you can proceed with the install.

SETTING UP THE ETHERNET PORT FOR ETHER-CUT (WIN 7)



Highlight Internet Protocol Version 4 (TCP/IPv4)

Click Properties Button


Local Area Connection Properties
Networking
Sharing
Connect using:
Broadcom 440x 10/100 Integrated Controller
Configure...
Internet Protocol Version 4 (TCP/IPv4) Properties
General
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Obtain an IP address automatically
Use the following IP address:
IP address: 10 . 9 . 9 . 1
Subnet mask: 255 . 255 . 255 . 0
Default gateway:
Obtain DNS server address automatically
Use the following DNS server addresses:
Preferred DNS server:
Alternate DNS server:
Validate settings upon exit
Advanced...
OK
Cancel

Select **Use the Following Address**

Enter the address exactly as shown 10.9.9.1

Enter the Subnet Mask exactly as shown 255.255.255.0

Leave all other settings blank (no DNS servers)

Click OK to save

CABLE CONNECTIONS for DTHC IV, C3 BUS & ETHER-CUT

IMPORTANT Connecting the yellow DTHCIV to PWM interface cable to the 4 Port Hub can Damage the 4 port hub and cause the DTHCIV to not function or fire the torch BE CAREFUL

ETHER CUT Connections Guide

To PWM Module

UP TO 25ft

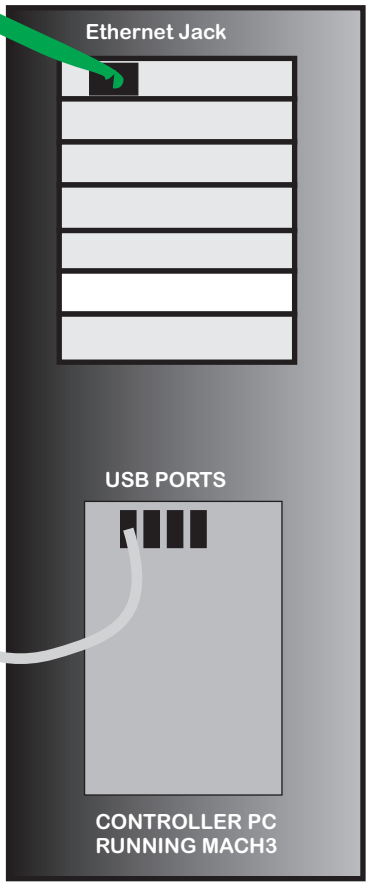
UP TO 25ft

Green Cat5 from Ethernet Jack on Ether-Cut front panel TO Ethernet jack on PC. Up to 25ft length.

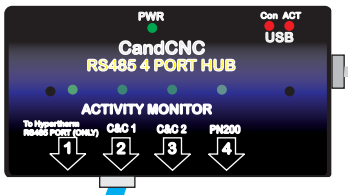
BLUE CAT5 cable for RS485 from C3BUS Jack on Ether-Cut to

UP TO 25ft

CAUTION: All cables are CAT5 UTP 8 conductor and will plug into any CAT 5 (RJ45) jack. We have color coded the cables to help keep them from being mis-connected. If you use other CAT cables be sure to label them on each end. Connecting cables wrong could damage modules.



CandCNC C3BUS RS485 4 Port Hub



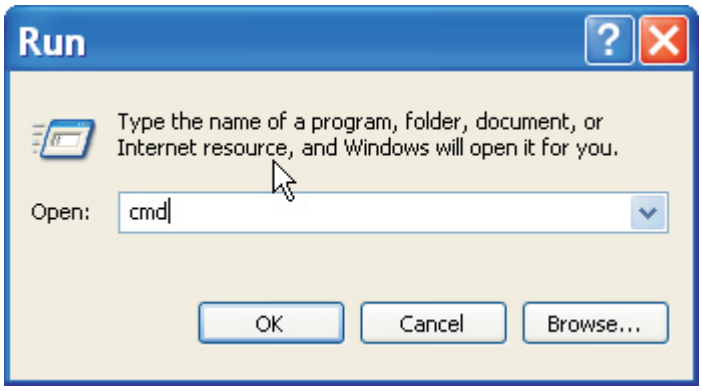
6 ft or less

HUB is REQUIRED for DTHC IV

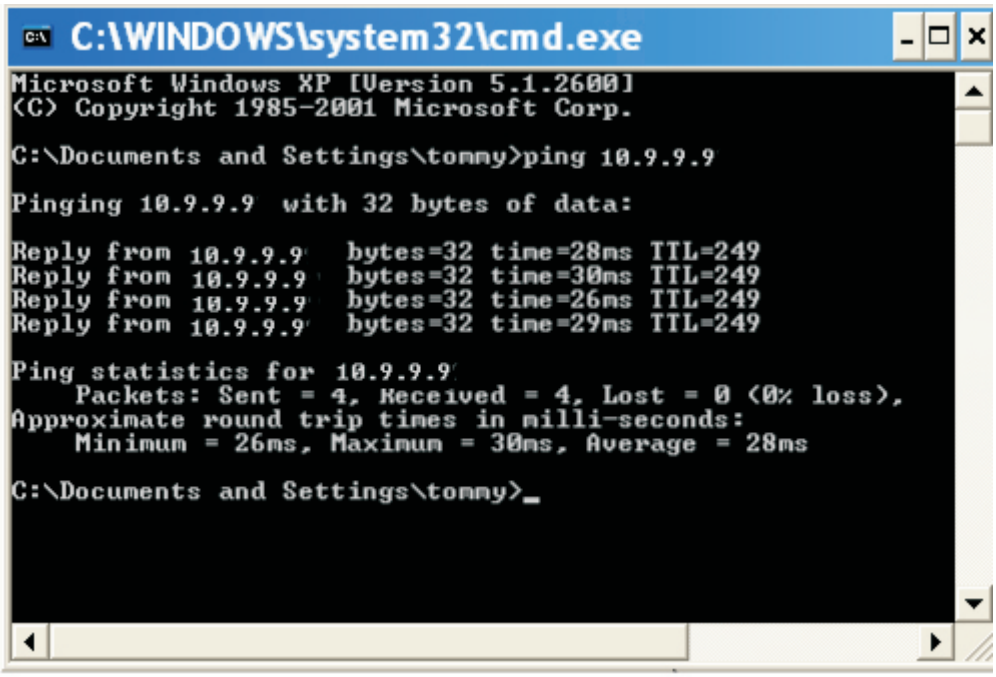
TESTING OF THE ETHERNET PORT

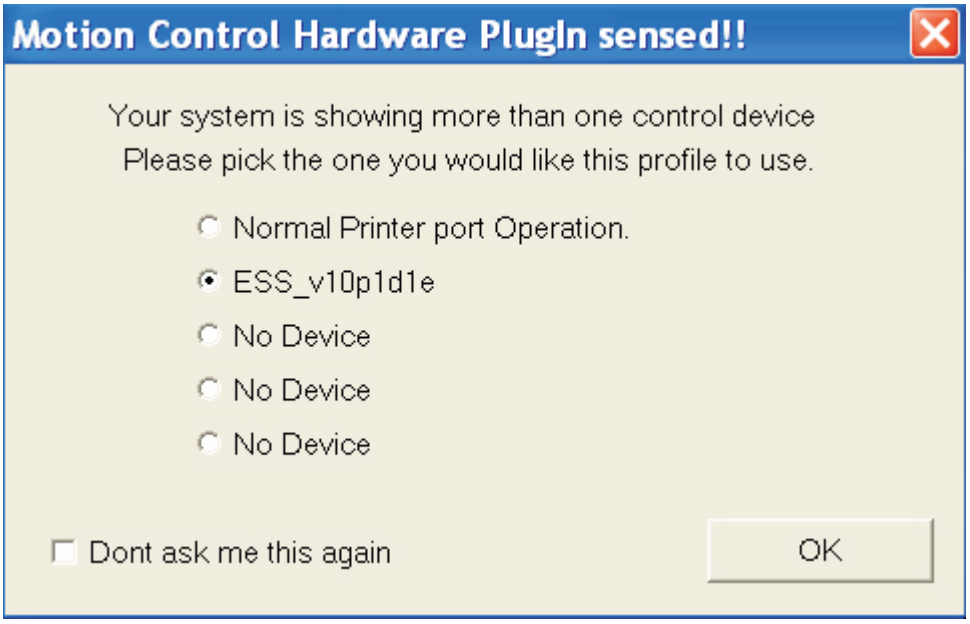
TESTING Your IP address:

To do this test you must have the Ether-Cut connected to the Ethernet jack on the PC. You should see the yellow LED on the JACK (RJ45) of the Ether-Cut come on steady as soon as the two are plugged in together and both powered up. This LED indicates there is a physical connection (the cable is good and both ends are connected and have power). **It DOES NOT indicate the two are actually talking (sending data).** The Green LED does indicate activity (both send and receive) so while it may confirm there are packets going both way it does not indicate there is full bi-directional Data Communications.



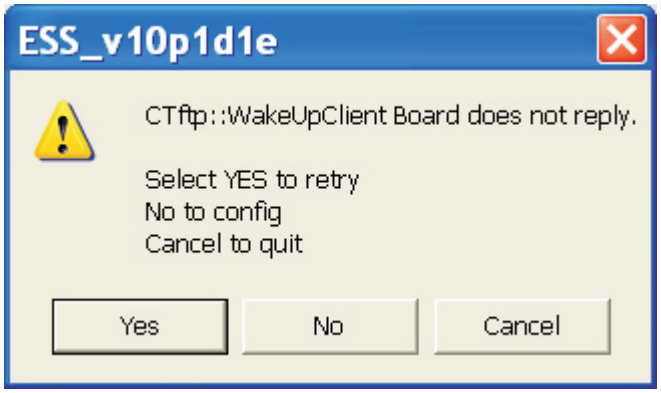
The ping test simply shows the IP addresses are correct and that the two devices are physically connected and will respond to an “are you there” request. You can have a successful PING test and still not be able to pass DATA back and forth.


C:\WINDOWS\system32\cmd.exe
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.
C:\Documents and Settings\tommy>ping 10.9.9.9
Pinging 10.9.9.9 with 32 bytes of data:
Reply from 10.9.9.9: bytes=32 time=28ms TTL=249
Reply from 10.9.9.9: bytes=32 time=30ms TTL=249
Reply from 10.9.9.9: bytes=32 time=26ms TTL=249
Reply from 10.9.9.9: bytes=32 time=29ms TTL=249
Ping statistics for 10.9.9.9:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 26ms, Maximum = 30ms, Average = 28ms
C:\Documents and Settings\tommy>_


Motion Control Hardware PlugIn sensed!!
Your system is showing more than one control device
Please pick the one you would like this profile to use.
Normal Printer port Operation.
ESS_v10p1d1e
No Device
No Device
No Device
Dont ask me this again
OK

When you open the Ether-Cut Profile for the first time you should see the dialog box above. MACH should recognize the ESS Ethernet device and ask you if you want to use it instead of the Parallel Port (You DO!).

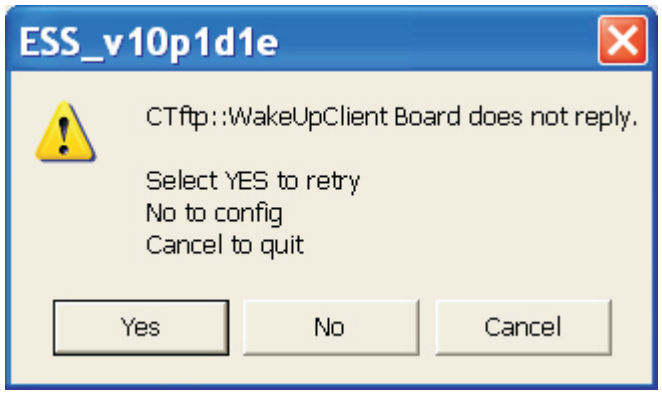
If you DO NOT see the dialog box and MACH opens then it may have already been set. If the ESS fails to load and you cannot get the screens in the **Plug-in Control menu** then use the top menu bar and the Functions Cfg's menu and select the **Reset Device Set** option. Stop and restart MACH. **If you get an error message like**

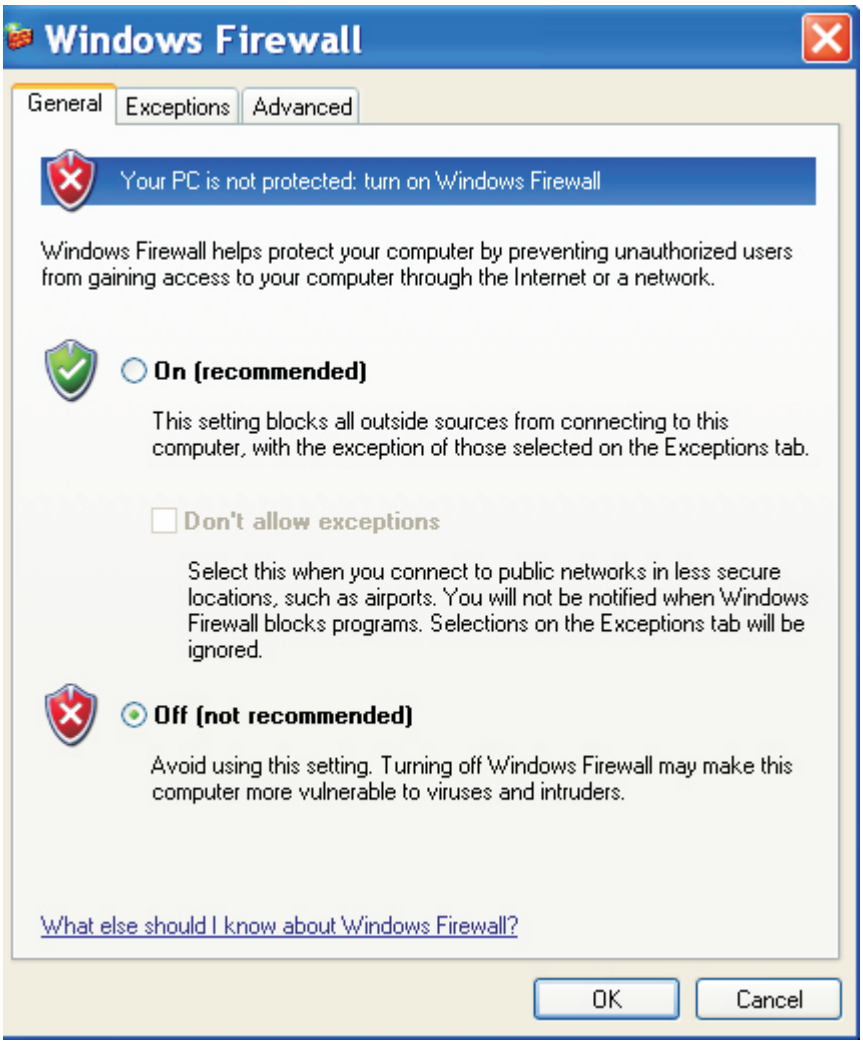


MACH does not see the ESS Ethernet Device and you need to go back through the IP setup and the tests to make sure the card is communicating with the PC Ethernet port. **Most common cause of no data to the ESS is having the firewall enabled in Windows for the Ethernet Channel you are using .**

Problems with ESS Communiations

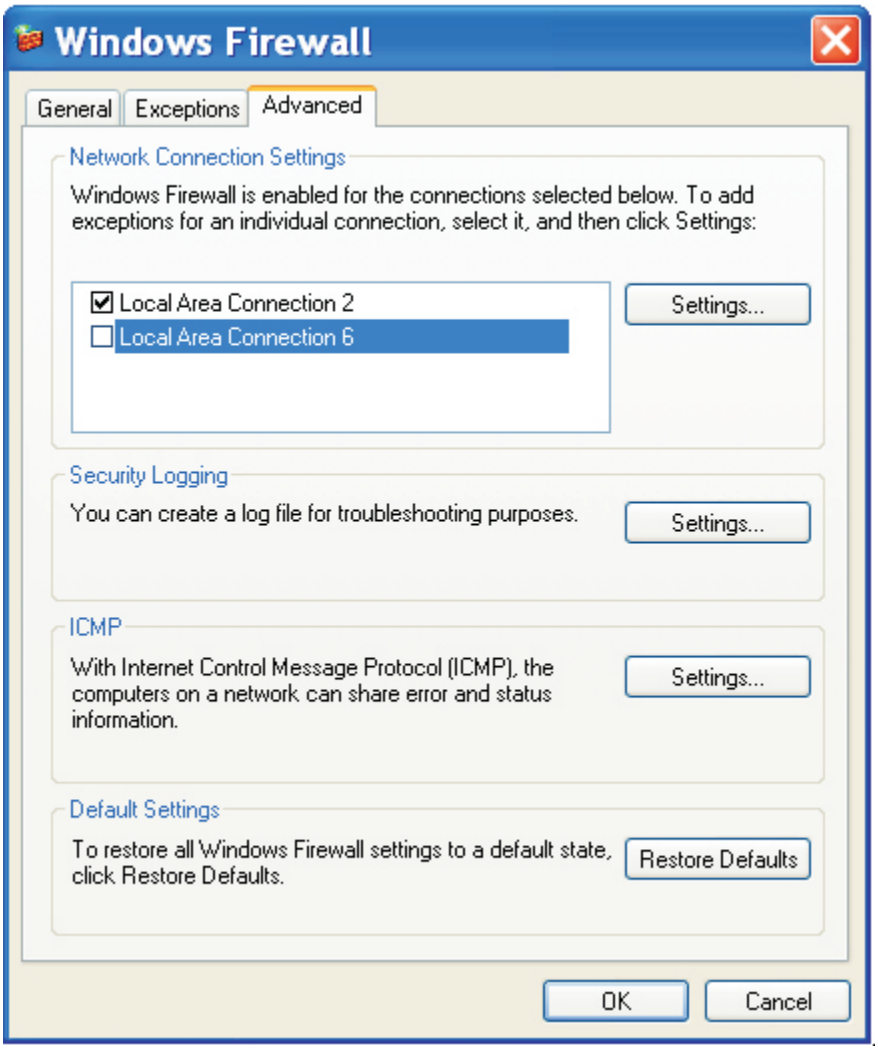
IMPORTANT NOTE: If you get the "WakeupClientBoard does not reply" and you are sure the plugin is enabled in the MACH/config Plugins, then check to make sure that you do NOT have Windows Firewall active on the Ethernet Port that the ESS is connected to. The PING test will pass but the Firewall will block normal TCP/IP traffic FROM the ESS and cause the error. To turn off the firewall in XP you need to go to Control Panel/ Windows Firewall




Windows Firewall
General
Exceptions
Advanced
Your PC is not protected: turn on Windows Firewall
Windows Firewall helps protect your computer by preventing unauthorized users from gaining access to your computer through the Internet or a network.
On (recommended)
This setting blocks all outside sources from connecting to this computer, with the exception of those selected on the Exceptions tab.
Don't allow exceptions
Select this when you connect to public networks in less secure locations, such as airports. You will not be notified when Windows Firewall blocks programs. Selections on the Exceptions tab will be ignored.
Off (not recommended)
Avoid using this setting. Turning off Windows Firewall may make this computer more vulnerable to viruses and intruders.
What else should I know about Windows Firewall?
OK
Cancel

If you are not going to allow this computer to connect to the Internet via another network connection (wireless or another ethernet card) then you can simply turn off the firewall by going to Control Panel/Windows Firewall and you will see the screen on the left.

If you are going to use this PC connected to another network (You should not try to share the ESS network connection with any other device) or to the internet via wired or wireless you can turn the firewall ON and go to the AdvancedTab and selectively turn off the firewall connection to the ESS and leave your other connection protected.


Windows Firewall
General
Exceptions
Advanced
Network Connection Settings
Windows Firewall is enabled for the connections selected below. To add exceptions for an individual connection, select it, and then click Settings:
Local Area Connection 2
Local Area Connection 6
Settings...
Security Logging
You can create a log file for troubleshooting purposes.
Settings...
ICMP
With Internet Control Message Protocol (ICMP), the computers on a network can share error and status information.
Settings...
Default Settings
To restore all Windows Firewall settings to a default state, click Restore Defaults.
Restore Defaults
OK
Cancel

The process to do this in WIN 7 is slightly different and involves going to the Security Settings in WIN 7 and disabling the Firewall by the network connection.

MODULES SETUP

DTHCIV MODULE

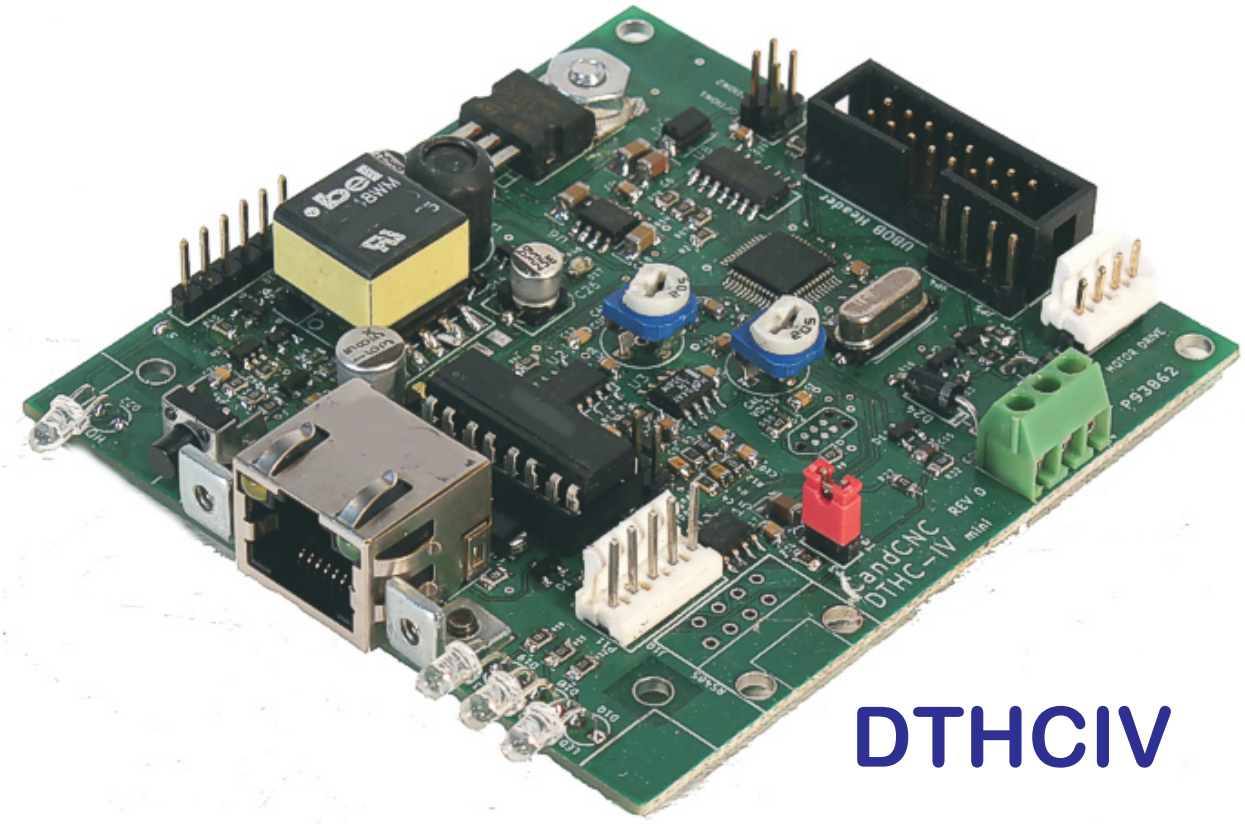
PWM MODULE

RAV-01/02 VOLTAGE DIVIDER (OPTION)

THE FOLLOWING SECTIONS DEAL WITH SETTING UP EACH MODULE.

IF YOU HAVE A CandCNC Product you may not need to use one or more of these sections since some products have theses modules already installed, tested and calibrated.

If you have a BLADERUNNER AIO DragonCut or any MP3000-DTHCII based product (Plazpaks) than YOU CAN SKIP THE SECTION ON INSTALLING AND SETTING UP THE DTHCIV Module.



DTHCIV

The following section goes through the initial setup and checking of the DTHCIV. The procedure is somewhat different than the previous DTHC and DTHCII and if you are upgrading from those platforms please take the time to go through this section. The end results will be more satisfactory than just plugging everything in and trying to cut a file.

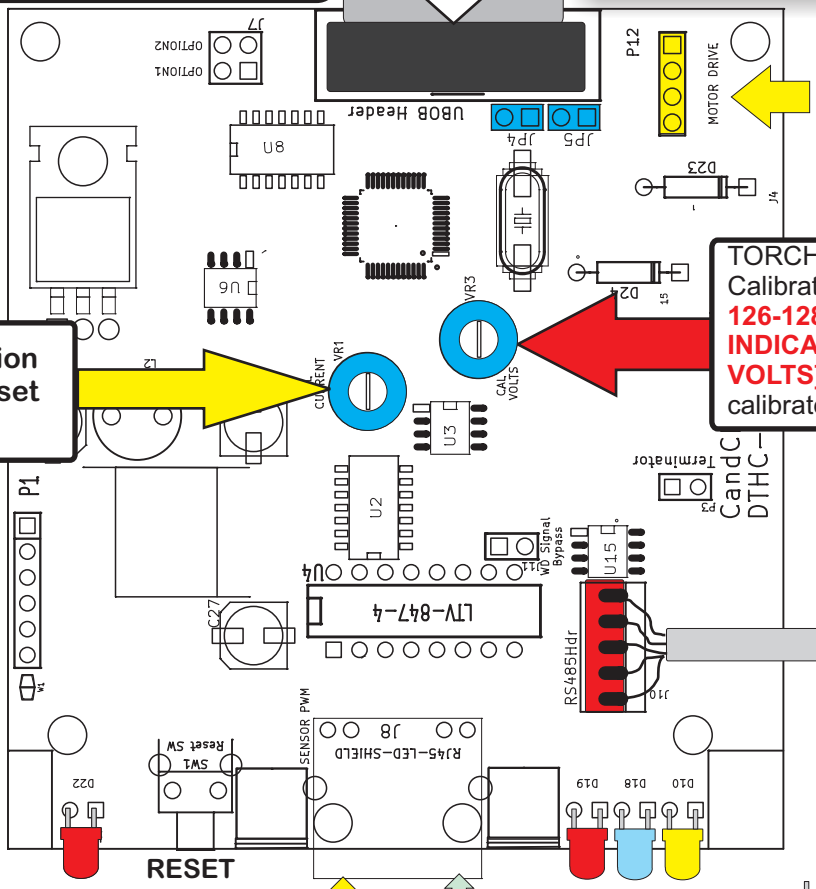
DTHCIV MODULE

DTHCIV EXPANSION MODULE. Located above the UBOBIII card in most CandCNC products. Ribbon cable connecting DTHC down to UBOB card may cover adjustment pots. If so, gently move it out of the way. Do not unplug the ribbon cable or the card will be disabled.

16 pin header (plug) for DTHC to UBOB Cable

BladeRunners and MP3100-DTHCIV Units have this module already installed and IT IS CALIBRATED. DO NOT ADJUST POTS.

INSTALL DTHC IV



Four wide cable is for UBOB cards prior to REV15.

Set JP4 and JP5 ON (jumpered) for REV15 UBOB . OFF for earlier versions.

DCP Calibration POT Factory set for 100A test

TORCH VOLTS Calibration **SET FOR 126-128VDC INDICATED [TORCH VOLTS]** Unit is calibrated at the factory.

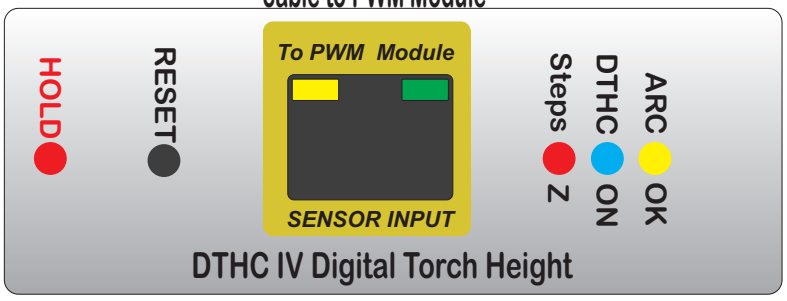
FRONT PANEL RS485 JACK

RESET

Yellow TORCH ON on when Torch fire signal is active

Green Power LED Should be ON

RJ45 connector for CAT5 cable to PWM Module



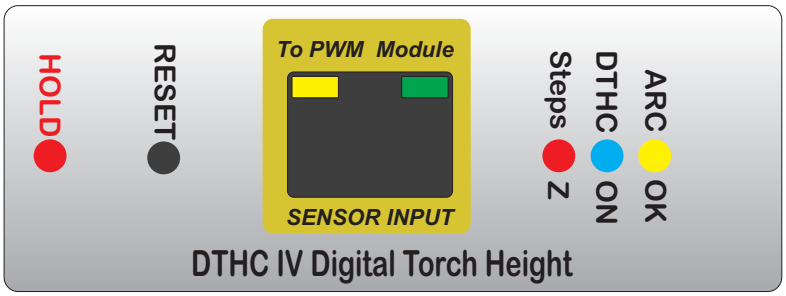
PRELIMINARY TESTING THE DTHC MODULE:

The only preliminary tests of the DTHCIV module are for power getting to the board and to test the RESET button and check for the initializations sequence on the front panel LED's.

1. Power up the BladeRunner/MP3000/MP3100/Plazpak and watch the front LEDs on the DTHCIV. They should turn on one at a time from right to left starting with the ARC OK LED, then all LEDs should flash twice. This indicates the microprocessor in the DTHCIV is live and working.

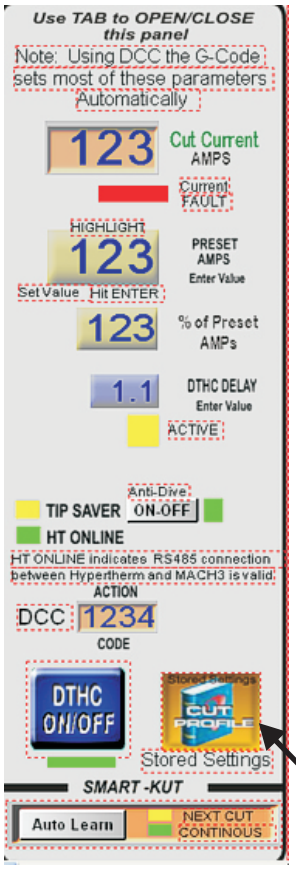
2. An integral part of the DTHCIV communications to and from MACH are dependant on the C3Bus USB to RS485 4 port Hub. A lot of testing and DTHCIV settings are done via the HUB UTILITY through the C3BUS. They will be covered later after the other components and cards have been installed and tested.

Front Panel Indicator Identification



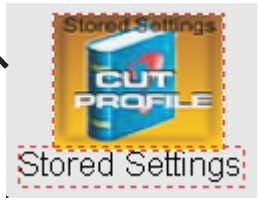
SIGNAL NAME	COLOR	FUNCTION (What it means)
ARC OK	YEL	Shows the torch is on and that there is a valid arc so automated Cutting can begin. Signal comes from Plasma (PWM Module) or from DCP-01 current reading.
DTHC ON	BLU	The DTHC can be turned on and off in software and from the screen. It shows when the DTHC is active.
STEPS Z	RED	Shows Z motion activity from both DTHC and MACH control
RESET	Button	RESET button resets the DTHCIV processor and does an initilization Pattern for self check
HOLD	RED	Indicates the DTHCIV has issued a HOLD command back to MACH to prevent motion
RJ45 RT	GRN	DTHCIV POWER INDICATOR On all of the time
RJ45 LFT	YEL	TORCH ON. Shows torch FIRE signal from MACH3

CUT PROFILES



How to access the CUT PROFILES (Stored Settings) in MACH.

Use the TAB key on your keyboard and the “Flyout” screen will pop up on the right side of your normal Program Run Screen. You can slide the separator bar over to uncover the Program Run screen if you want to have both open at the same time. NOTE: It is best to run your video screen resolution at 1280 X 1024 or higher so the program run screen does not take up all of the monitor and you have some room left for the flyout. Most video drivers and monitors will handle 1280 X 1024 and later ones have other resolutions higher. The MACH screens we supply are 1024 X 768. The higher the resolution you run in windows the smaller portion of the monitor the MACH screen takes up. Set your system up to your preference with the tab flyout in mind. Most of the settings on the tab flyout are not done while you are cutting

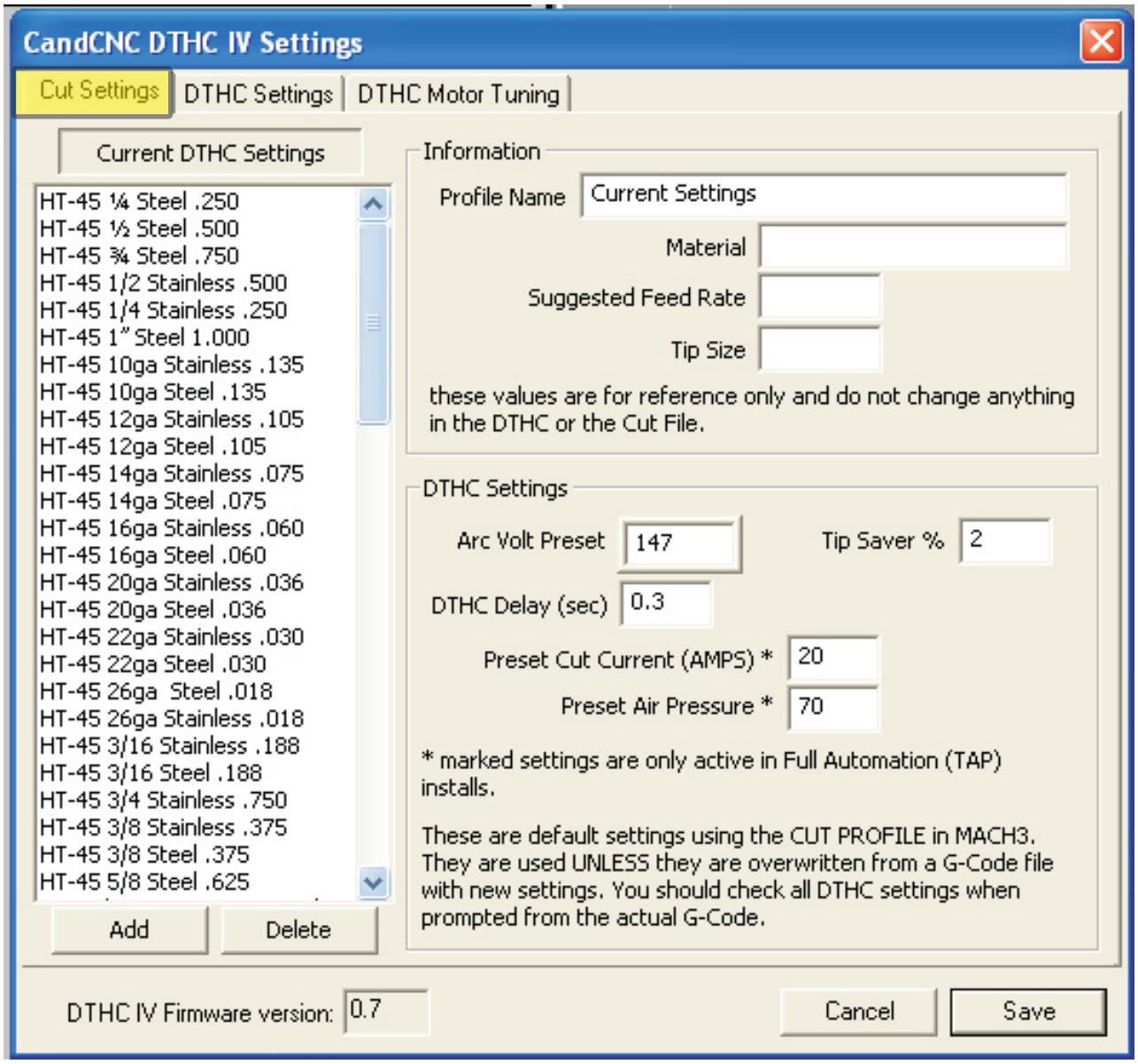


To access the following setting screens you have to click on the CUT PROFILES Button (located on the tab flyout on most screen sets.

WARNING: If you do not have the C3BUS Hub setup and working and the DTHCIV shows up in the device list, THIS BUTTON DOES NOTHING! Without communication between MACH and the DTHCIV you cannot read or change settings.

NOTE: DTHCII and older screen sets only have one level of tabs to select, edit and choose a CUT PROFILE. Your old CUT PROFILES from earlier installs will still be there but now you have additional tabs and settings available. This is an important thing to note in the DTHCIV setup and interface.

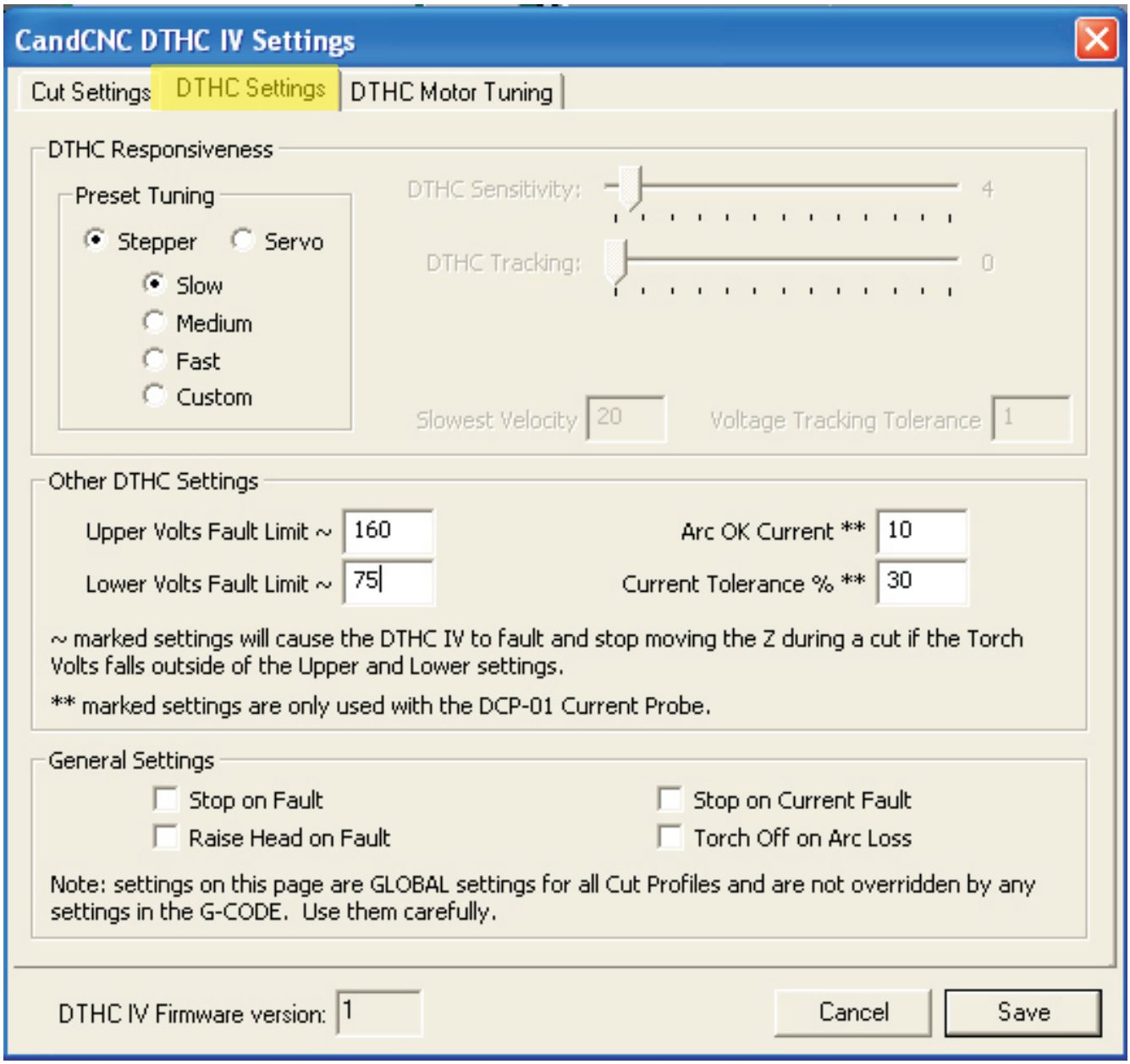
DTHC IV MACH3 CUT SETTINGS TAB


CandCNC DTHC IV Settings
Cut Settings
DTHC Settings
DTHC Motor Tuning
Current DTHC Settings
HT-45 ¼ Steel .250
HT-45 ½ Steel .500
HT-45 ¾ Steel .750
HT-45 1/2 Stainless .500
HT-45 1/4 Stainless .250
HT-45 1" Steel 1.000
HT-45 10ga Stainless .135
HT-45 10ga Steel .135
HT-45 12ga Stainless .105
HT-45 12ga Steel .105
HT-45 14ga Stainless .075
HT-45 14ga Steel .075
HT-45 16ga Stainless .060
HT-45 16ga Steel .060
HT-45 20ga Stainless .036
HT-45 20ga Steel .036
HT-45 22ga Stainless .030
HT-45 22ga Steel .030
HT-45 26ga Steel .018
HT-45 26ga Stainless .018
HT-45 3/16 Stainless .188
HT-45 3/16 Steel .188
HT-45 3/4 Stainless .750
HT-45 3/8 Stainless .375
HT-45 3/8 Steel .375
HT-45 5/8 Steel .625
Add
Delete
Information
Profile Name
Current Settings
Material
Suggested Feed Rate
Tip Size
these values are for reference only and do not change anything in the DTHC or the Cut File.
DTHC Settings
Arc Volt Preset
147
Tip Saver %
2
DTHC Delay (sec)
0.3
Preset Cut Current (AMPS) *
20
Preset Air Pressure *
70
* marked settings are only active in Full Automation (TAP) installs.
These are default settings using the CUT PROFILE in MACH3. They are used UNLESS they are overwritten from a G-Code file with new settings. You should check all DTHC settings when prompted from the actual G-Code.
DTHC IV Firmware version:
0.7
Cancel
Save

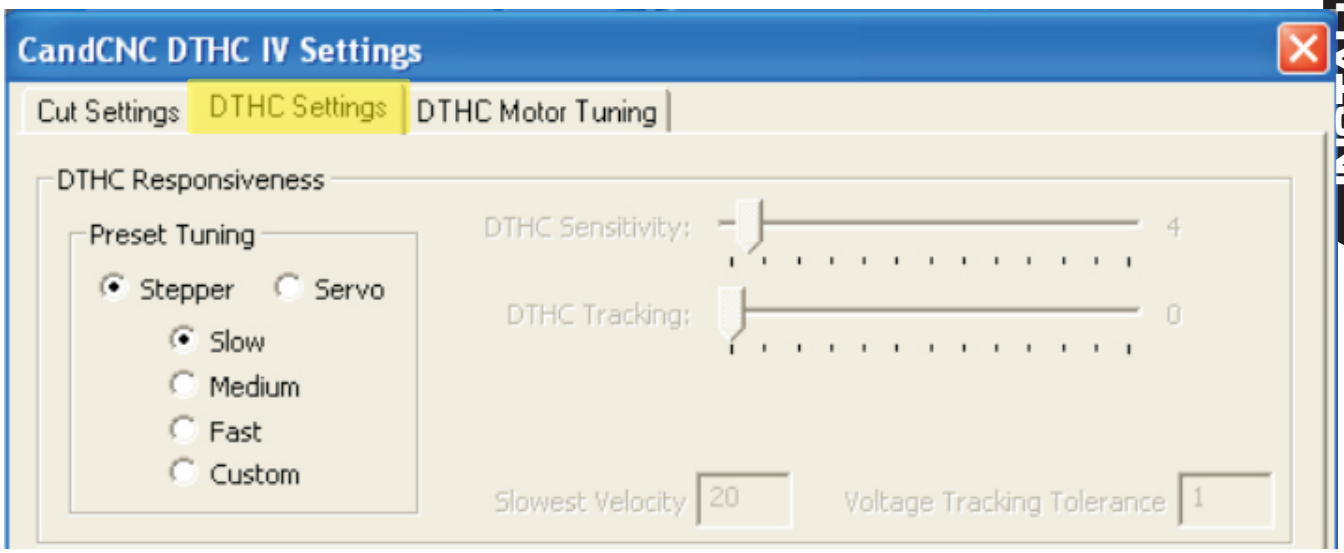
This is the opening TAB of the CUT PROFILE MENU. The DTHCII version of this screen only has one level and is used to set the DTHC parameters for a cut. There are STORED SETTINGS and they are listed in the Current DTHC Settings window. The DTHC cut values can be changed on the screen and Save applies them to the DTHC memory. You can add new profiles with different presets.

NOTE: The DCC function provided by using SheetCAM TNG and the POSTS that support DCC WILL OVERRIDE THESE SETTINGS when the G-Code is loaded and the RUN button is hit. The operator can choose to override the base settings via the screen (Preset Volts, DTHC Delay, etc) OR override the entire profile by opening the CUT PROFILE and hitting SAVE after the G-code has stopped on the tool. CAUTION: The code stops on each tool used and the settings are updated. The last set of parameters to be loaded to the DTHC memory will be the one used during the cut.

DTHC IV MACH3 CONTROL
DTHC SETTINGS TAB



DTHC SETTINGS TAB opens up a screen with 3 sections. Each one has specific functions that will be covered in the following pages. The DTHC Settings effect the Operation of the DTHCIV and are global and not by Cut Profile (previous TAB). These settings remain in effect until they are changed in this menu.



SELECTING DTHC RESPONSE PRESETS

There are six DTHC Response presets for different types of cutting conditions. There are three for Stepper and Three for Servo based Z axis.

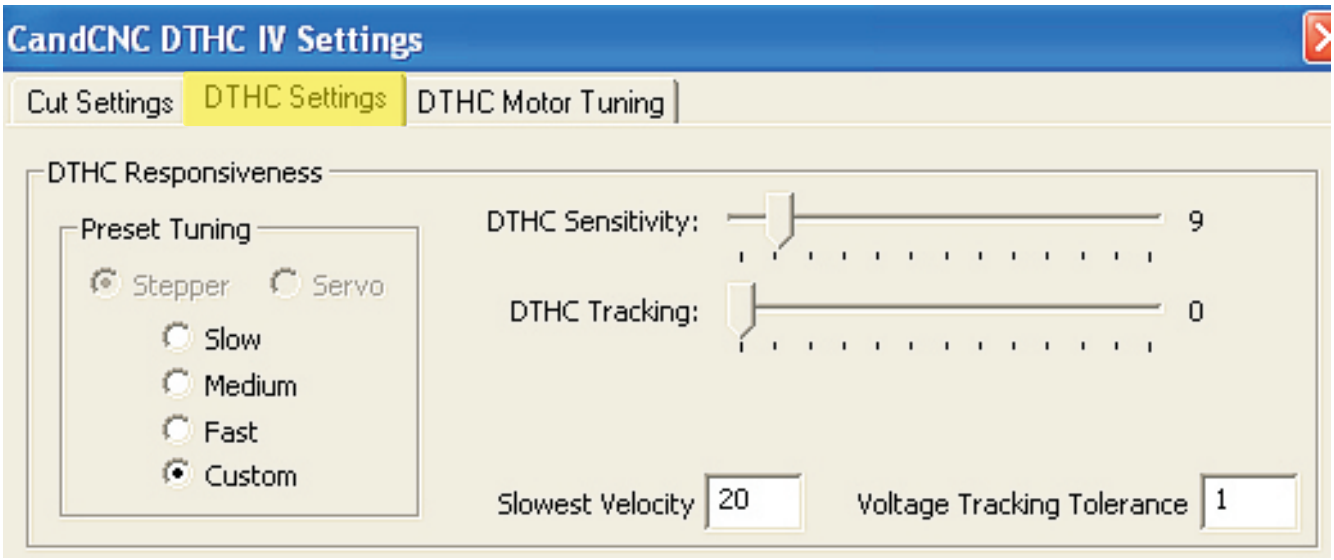
Slow Preset: Is for general flat sheet cutting of material that does not tend to warp more than about a ½"rise over 2 inches or more of length. Slow does not mean the motion is slow but rather it slows down the response to voltage change during a cut and dampens over-response to brief spikes or dips in arc gap (arc volts).

Medium Preset: Is for cutting thinner material that can warp more intensely and allows response to cut up to about a 30 deg rise at rates up to about 200 IPM XY rates*. Select this Preset if you cut 16ga and thinner and you see a lot of warping and vertical changes.

Fast Preset: Is for very aggressive cutting on severe warps, corrugated or at very high cut rates. This setting will function to cut up to a 45 deg slope at 180 IPM and smaller slopes at 350 IPM*. It will cut thin corrugated. (Some other DTHC settings may need to be adjusted.)

Stepper setting VS Servo setting. Servos present different dynamics and tuning issues than steppers. They typically have much faster top velocity rates and a wider range of torque. Only select this mode is your Z is a servo motor.

* It is important to understand that the above settings and suggestions are based on typical leadscrew type Z mechanisms with average **pitch** of .2 " (5 mm) for stepper and .1 " (2.54 mm) for servo. The settings may need to be adjusted for courser or finer pitches. Use the CUSTOM setting if the presets do not product smooth response.



SETTING DTHC RESPONSE USING CUSTOM Settings

If you select CUSTOM in the Preset Tuning buttons the **DTHC Sesitivity** and **DTHC Tracking** will no longer be grayed out and can be used to custom tune the Z for a given condition. You may find that custom tuning is needed if your Z mechanics are either very course or very fine.

DTHC Sensitivity determines the response RATE (how quickly the Z responds to small changes in the ARC VOLTS). Setting the DTHC Sensitivity higher will force the DTHCIV and the Z to increase the rate that it responds.

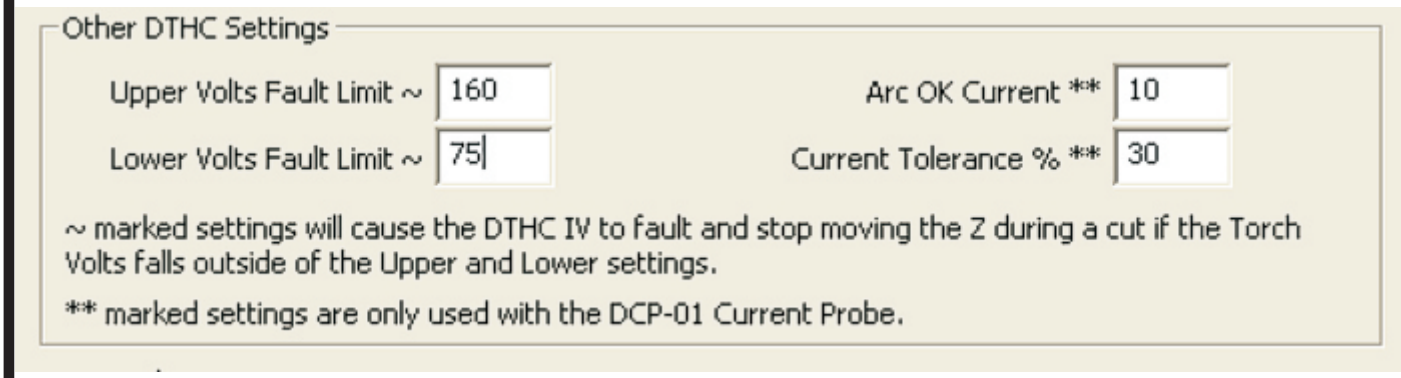
DTHC Tracking determines how close to the PRESET VOLTS the DTHCII will try and hold the changes (dampening). The resolution of the DTHCIV is 1/16 VDC. It uses a unique non-linear averaging algorithm developed specifically for Torch Height Control. Typically the two settings are interactive. If you increase one you may need to decrease the other or vice versa. Too much DTHC Tracking will cause Z oscillation (the Z will move up and down rapidly as it cuts). Zero tracking is a valid setting in some circumstances. **When making changes to either setting, do so in small increments**. Once you have a good setting make note (write it down) for both values. Over time we will develop numbers for different configurations of Z mechanics and motors and make them available in a chart.

Slowest Velocity (Default value = 10) is the slowest speed in IPM that Z will travel while under DTHC control. It the DTHC moves based on an error voltage this is the MINIMUM speed it can move at. (it moves faster the greater the error). It effects the lower end of the response curve to give better response to small amounts of change.

Voltage Tracking Tolerance. This is the voltage range that the DTHC works across from minimum to maximum velocity. It is the allowable error. This works in combination with the DTHC tracking value to establish the response curve of the DTHC. The value is in VOLTS of error and the default 1 volt setting is appropriates for most applications.

DTHC IV MACH3 CONTROL
DTHC SETTINGS TAB

OTHER DTHC SETTINGS. Located in the Center of the DTHC SETTINGS TAB the 4 input boxes allow for changes in the Voltage Fault (volts out of range error code trigger) and two inputs for use if the DCP-01 is being used. (NOTE: the ARC OK CURRENT needs to be set to some value above 0 or it will false trigger on systems that DO NOT use the DCP-01).


Other DTHC Settings
Upper Volts Fault Limit ~
160
Lower Volts Fault Limit ~
75
Arc OK Current **
10
Current Tolerance % **
30
~ marked settings will cause the DTHC IV to fault and stop moving the Z during a cut if the Torch Volts falls outside of the Upper and Lower settings.
** marked settings are only used with the DCP-01 Current Probe.

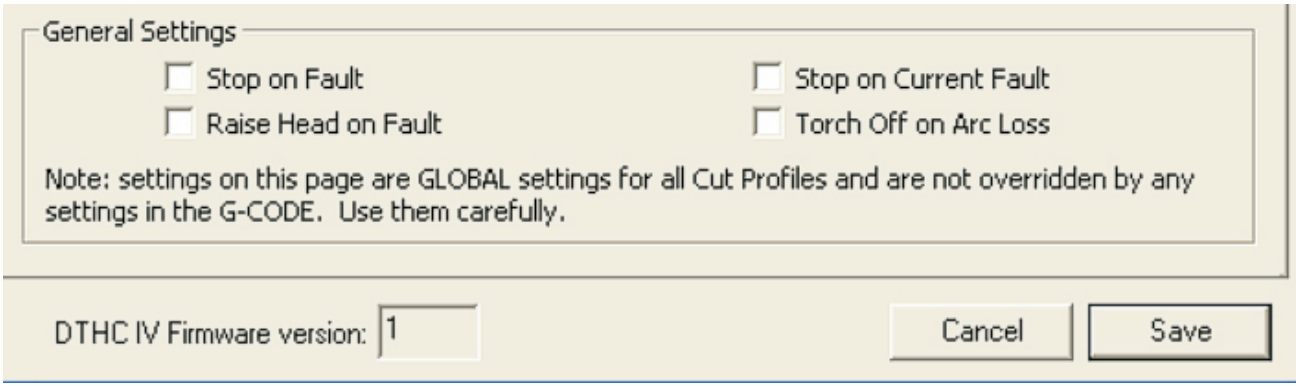
Upper Volts Fault Limit: Set this value to about 10% below the open circuit voltage of your plasma torch (voltage when fired in the air). It will prevent DTHC signals from moving the torch too far down in the event the torch runs off the material or hits a void.

Lower Volts Fault Limit: Set this value to a number that triggers a fault if the voltage is below the normal cutting voltage of the torch with the consumables you use.

If you change consumables that have different settings you may need to adjust the parameters or you can set the lower limit to reflect the lowest voltage used with ANY type consumable.

Arc OK Current: This setting is used when the plasma unit you are using DOES NOT HAVE an ARC OK (OK to MOVE; Arc Xfr; TRANSFER, Etc) signal. The UNIVERSAL CONNECTION KIT from CandCNC has the DCP-01 Digital Current Probe that reads Arc Current (amps) flowing in the Workclamp lead and is used to trigger the ARC OK signal. If you have the DCP-01 connected and in use either in the Universal Connection Kit or as part of the TAP (Advanced Interface Kit) you should set the Arc OK value to about ½ of the lowest cut current you use. *It is important to understand that the ARC OK can be triggered by EITHER the hard signal reading coming from the plasma or from the DCP-01 reading current greater than the Arc OK Current setting*.

Current Tolerance: This setting is a percentage of the indicated Cut Current and works in conjunction with the ARC OK CURRENT and has to have the DCP-01 to monitor the actual cut current. It triggers a current fault and there are General Options that control what happens if a current fault uses the PRESET CURRENT value (not on this screen).


General Settings
Stop on Fault
Stop on Current Fault
Raise Head on Fault
Torch Off on Arc Loss
Note: settings on this page are GLOBAL settings for all Cut Profiles and are not overridden by any settings in the G-CODE. Use them carefully.
DTHC IV Firmware version:
1
Cancel
Save

General Settings are options to do specific functions in the event of a Fault. Faults come from two sources: Voltage outside the range of the Upper Volts Fault Limit or the Lower Volts Fault Limit OR if you are running with a DCP-01 module and have actual cut current readout and parameters set for Arc OK Current and Current Tolerance, Current that falls outside the parameters you have set.

Stop on Fault Stops motion in MACH if there is a VOLTAGE fault.

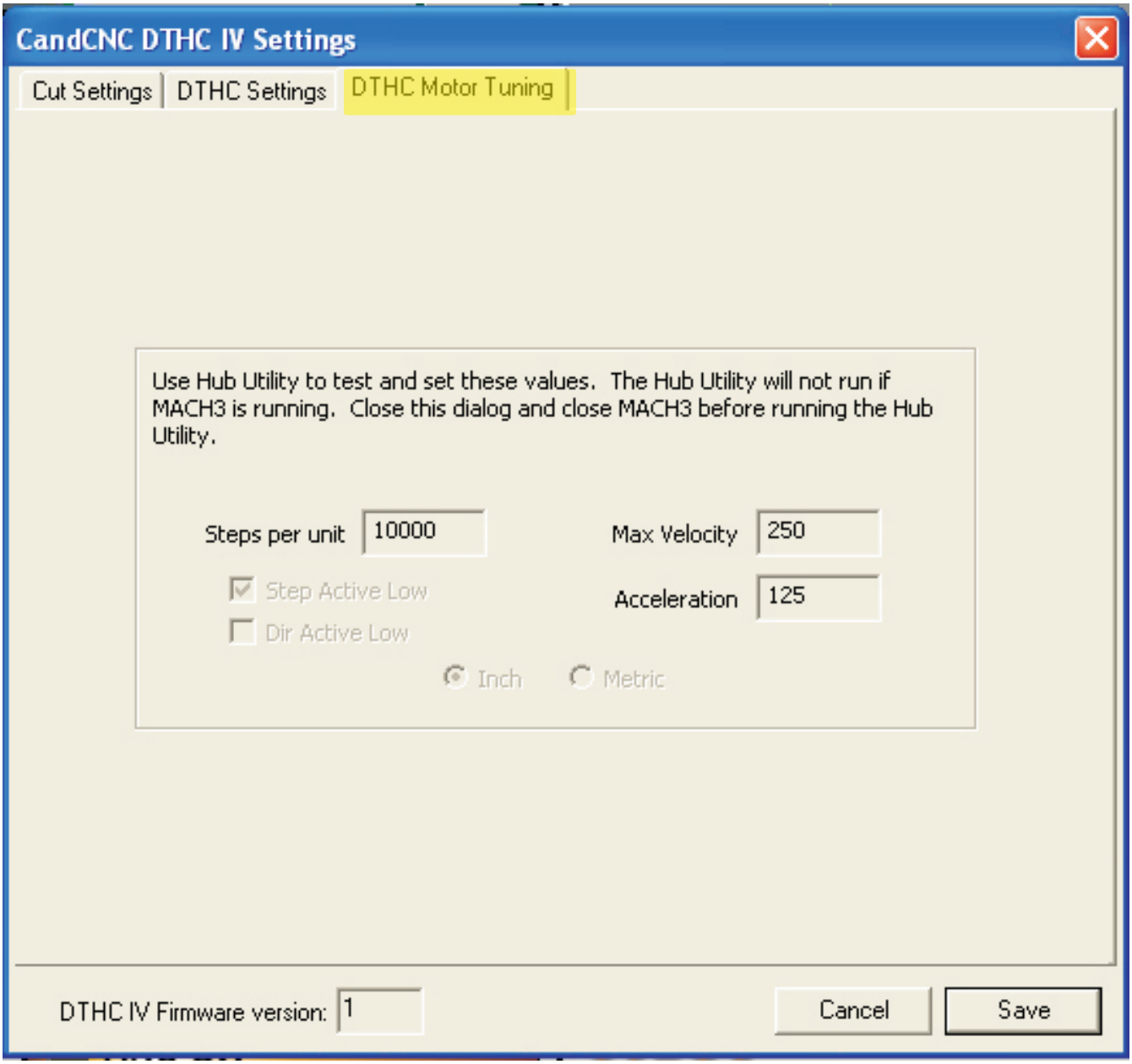
Raise Head on Fault Does a quick retract of the Z up to Safe Height on a VOLTAGE fault.

Stop on Current Fault Stops motion in MACH if there is a CURRENT FAULT.

Torch Off on Arc Loss This turns off the OUTPUT in MACH that fires the torch. Most torches will turn off if they lose arc (typically they lose arc *because* they have been turned off) but the OUTPUT will stay on in MACH.

DEFAULT SETTINGS All boxes unchecked (off). It is recommended that you leave them unchecked until you have the system setup and cutting well. Only turn any one of there if there is a specific problem that needs to be fixed. The cause of a the fault is more important to resolve than what happens after. If you have faults while cutting there is usually a reason and it needs to be investigated and fixed.

This screen is INFORMATIONAL ONLY. You must set the DTHC Motor Parameters in the HUB UTILITY. The values shown may not be the ones your system uses.

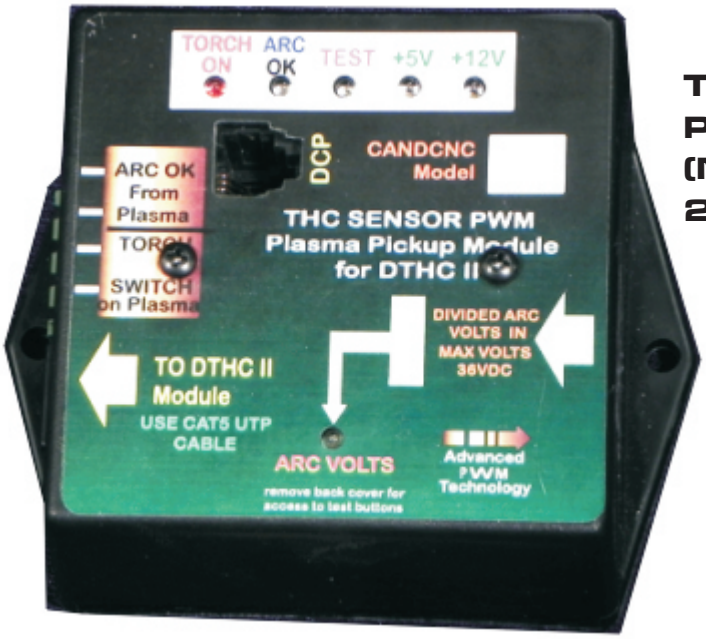


IMPORTANT: The this is NOT the same as the motor tuning for Z done in MACH/Config/Motor Tuning. It shows the tuning for Z when it is controlled by the DTHC IV. T he Steps per Unit HAVE to be the same in all tuning for Z. The Velocity and acceleration can be different and are set by testing using the HUB UTILITY and tuning and testing the DTHCIV in that menu

END OF DTHC IV MODULE INSTALL

SETTING UP THE THC SENSOR PWM MODULE

IF you already have a working PWM Module with your DTHC II of either REV number and you are just upgrading to the DTHC IV you can skip this section of the setup



THC SENSOR PWM REV 17 (Mod A) to REV 20

PWM MODULE REV 21 and later

The THC SENSOR PWM MODULE (PWM Module) has been redesigned to fit into a smaller case. The function and settings are EXACTLY THE SAME. If you have a working REV 20 or sooner module your DO NOT need to upgrade it to a newer REV 21. This manual is written for using either module and the setup and testing is the same . Certain indicators and button locations have been moved.

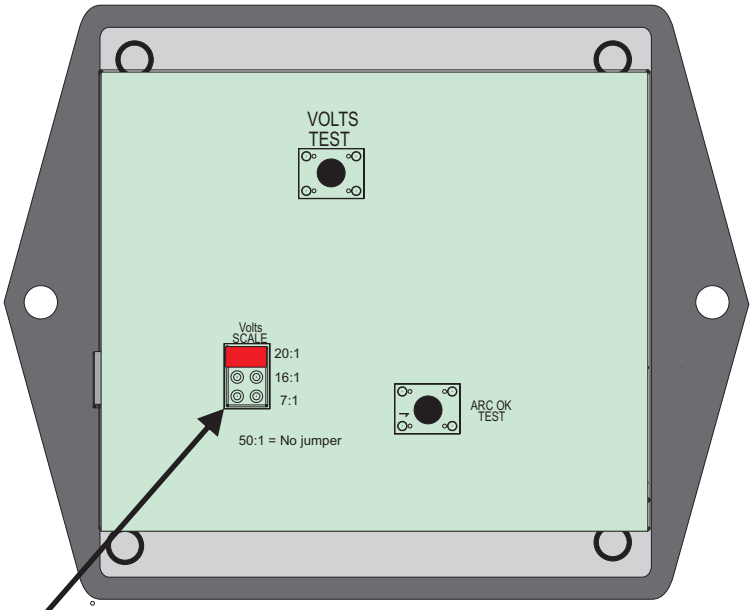
SETTING THE THC SENSOR PWM PRESCALE DIVIDER RATIO

THIS MUST BE DONE TO MATCH YOUR INSTALL UNITS ARE SHIPPED TO MATCH THE RAV-01 (7:1) RATIO. USE THE CHART BELOW IF YOU ARE USING THE MODULE WITH A PLASMA WITH AN INTERNAL VOLTAGE DIVIDER. SEE THE SECTION ON CONNECTING A PLASMA WITH AN INTERNAL VOLTAGE DIVIDER TO DETERMINE TE PROPER RATIO

To set THC SENSOR PWM ratio divider option:

1. Remove rear cover of THC SENSOR PWM Case
2. Determine the proper setting for the type setup you have.
3. Set the small option jumper to match.

OLDER MODEL REV 17 - REV 20 Shown.

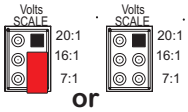


Back of THC SENSOR PWM Cover removed

20:1 Scale (Hypertherm and some others)

16:1 Standard on Thermal Dynamics, others

7:1 Divider (from CandCNC RAV-01 Card)



50:1 Standard on Hypertherm, Thermal Dyamics, others

IMPORTANT:
The Hypertherm 45 has an internal voltage divider. It cannot be changed for the 50:1 ratio. Set your THC SENSOR PWM jumper to the 50:1 position if you are using the MIC-01 Direct Connect Cable.

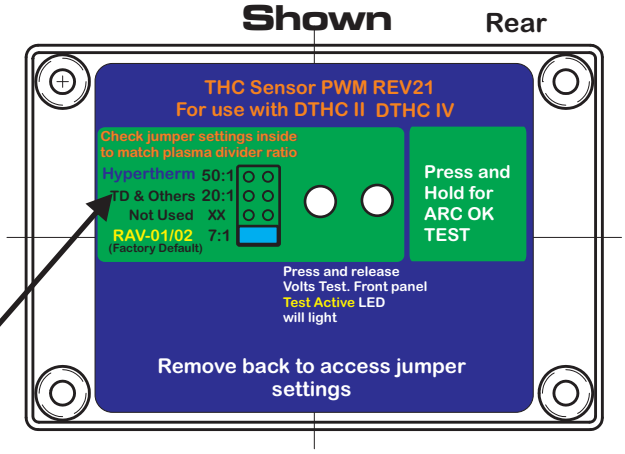
SETTING THE THC SENSOR PWM PRESCALE DIVIDER RATIO(REV21)

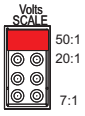
THIS MUST BE DONE TO MATCH YOUR INSTALL UNITS ARE SHIPPED TO MATCH THE RAV-01 (7:1) RATIO. USE THE CHART BELOW IF YOU ARE USING THE MODULE WITH A PLASMA WITH AN INTERNAL VOLTAGE DIVIDER. SEE THE SECTION ON CONNECTING A PLASMA WITH AN INTERNAL VOLTAGE DIVIDER TO DETERMINE TE PROPER RATIO

To set PWM SENSOR ratio divider option:

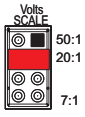
1. Remove rear cover of THC SENSOR PWM Case
2. Determine the proper setting for the type setup you have.
3. Set the small option jumper to match.

NEW MODEL
REV 21
Shown

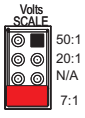

Rear
THC Sensor PWM REV21
For use with DTHC II DTHC IV
Check jumper settings inside to match plasma divider ratio
Hypertherm 50:1
TD & Others 20:1
Not Used XX
RAV-01/02 7:1
(Factory Default)
Press and Hold for ARC OK TEST
Press and release Volts Test. Front panel Test Active LED will light
Remove back to access jumper settings



50:1 Scale (Hypertherm and some others) Recommended for Hypertherm with CPC



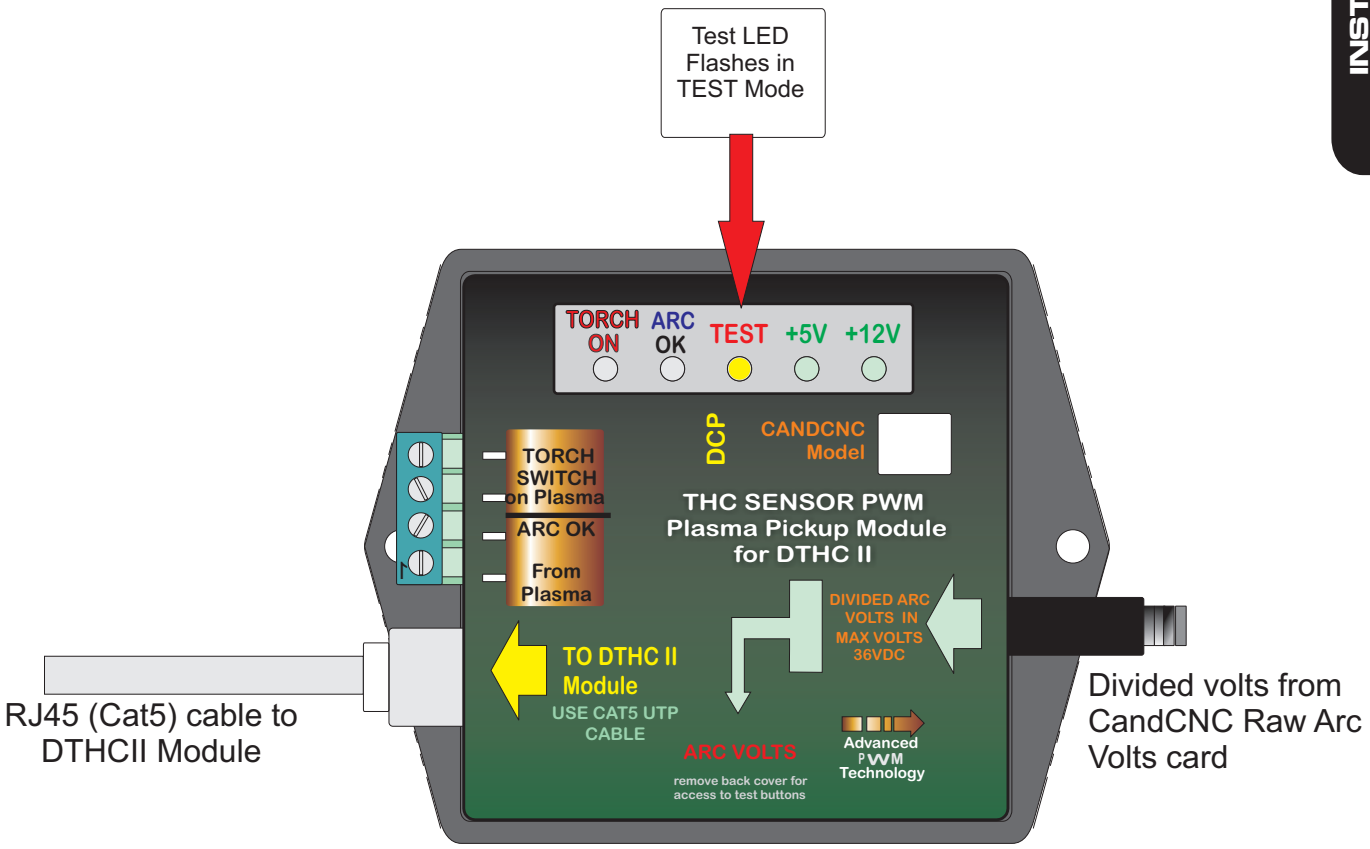
20:1 Standard on some Thermal Dynamics, others



7:1 Divider (from CandCNC RAV-01 Card) DEFAULT

IMPORTANT:
The Hypertherm 45 has an internal voltage divider. It cannot be changed from the 50:1 ratio. Set your PWM Sensor jumper to the 50:1 position if you are using the MIC-01 Direct Connect Cable.

THC SENSOR PWM MODULE VOLTS TEST/CAL



THC SENSOR PWM (Plasma Pickup Module) can be put in TEST/CAL mode without removing the card from the case.

✍ Turn the case over and remove the 4 corner screw holding the back on and carefully pry off the back panel. It will expose the back of the PC board and there are two small momentary pushbuttons and a dual row of option jumpers. The switches are small tactile switches that require light pressure.

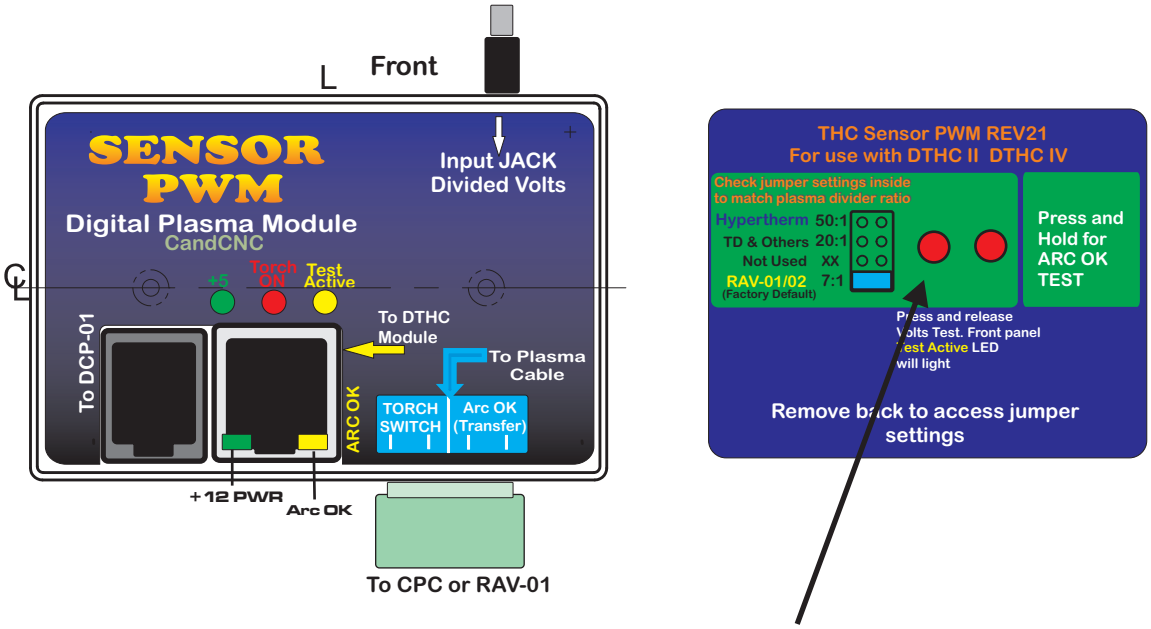
✍ One push puts the unit in test/cal mode. The Test LED will flash. 126 to 127 ✍will display on the TORCH VOLTS DRO.

✍ A second push will take the unit out of test/cal mode and the LED will stop flashing and the TORCH VOLTS reading will return to Zero.

✍ Once in TEST mode you can calibrate the DTHC II module to display the correct TORCH VOLTS on the screen. See the DTHCII module section in the front part of this manual to find the calibration points. The THC SENSOR PWM is factory calibrated. Do not try to set the calibration if the test voltage is MORE THAN A FEW VOLTS OFF THE TARGET OF 126. It will not fix problems with reading the torch volts or if it displays wrong when the torch is fired!

The calibration is based on a simulated PWM from the circuit *so if the prescale divider setting is wrong the calibration will show correct but when the torch is fired the voltage will be wrong.*

THC SENSOR PWM MODULE TEST/CAL



THC PWM Module Rev 21 (Plasma Pickup Module) can be put in TEST/CAL mode without removing the card from the case.

✍ Turn the case over and look on the back. There are two recessed test buttons find the button marked VOLTS.

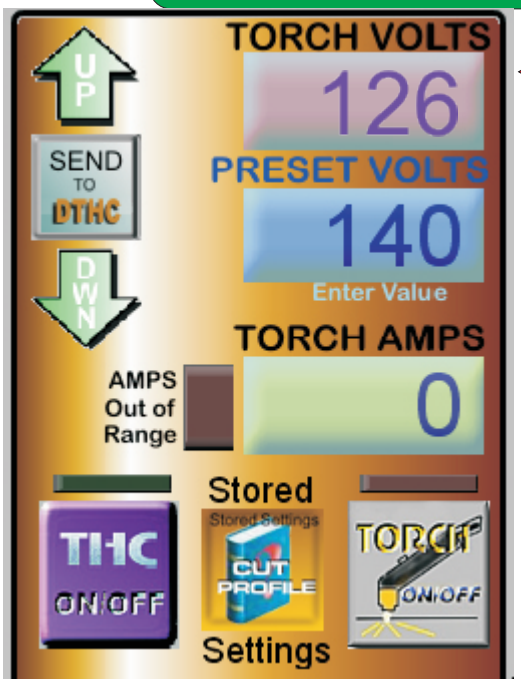
✍ One push puts the unit in test/cal mode. The Test Active on the front LED will flash. You should see 126 to 128 volts displayed on the TORCH VOLTS in the MACH screen

✍ A second push will take the unit out of test/cal mode and the LED will stop flashing and the TORCH VOLTS reading will return to Zero.

✍ Once in TEST mode you can calibrate the DTHCIV module to display the correct TORCH VOLTS on the screen. See the DTHCII module section to in the front part of this manual to find the calibration points. The THC SENSOR PWM is factory calibrated. Do not try to set the calibration if the test voltage is MORE THAN A FEW VOLTS OFF THE TARGET OF 126. It will not fix problems with reading the torch volts or if it displays wrong when the torch is fired!

The calibration is based on a simulated PWM from the circuit ***so if the prescale divider setting is wrong the calibration will show correct but when the torch is fired the voltage will be wrong.***

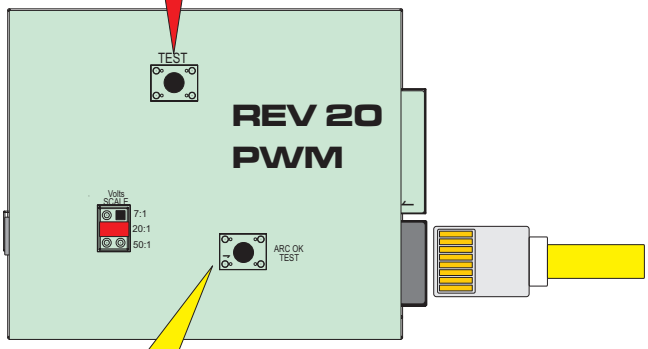
THC SENSOR PWM MODULE VOLTS TEST/CAL



Depress and release TEST button to test PWM circuit back to DTHC II. Test LED on front will flash and DTHC screen in MACH should display a voltage. Calibrated units (see calibration section) should display 126 to 128 volts during test.

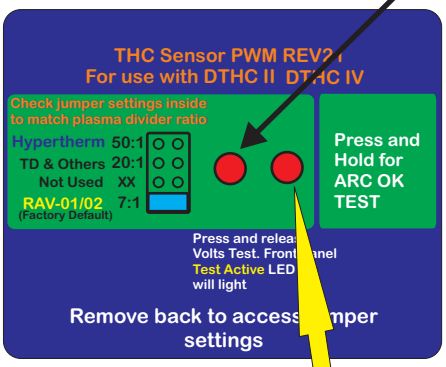
CandCNC THC SENSOR PWM Card REV 20

Case not shown for clearity



REV 21 PWM

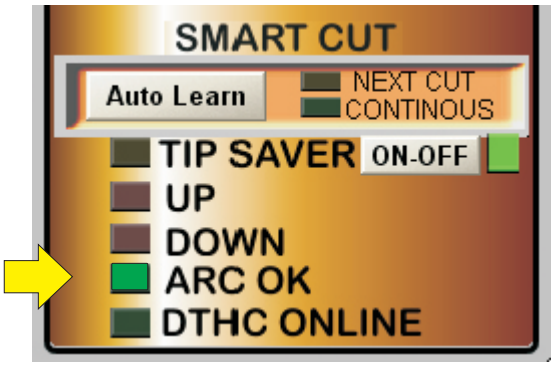
CandCNC PWM SENSOR Card REV 21


THC Sensor PWM REV21
For use with DTHC II DTHC IV
Check jumper settings inside to match plasma divider ratio
Hypertherm 50:1
TD & Others 20:1
Not Used XX
RAV-01/02 7:1
(Factory Default)
Press and Hold for ARC OK TEST
Test Active LED will light
Remove back to access jumper settings

CHECKING ARC OK SIGNAL BACK TO DTHC II CARD:

1. Remove case bottom. (rev 20 version)
2 With RJ45 (UTP cable) connected to DTHCII and unit powered up, depress the ARC OK TEST BUTTON on the card. The ARC OK LED on the MACH screen should light. The ARC OK test LED on the front of the case will light.

NOTE: rev 21 module has rear access holes for test buttons but the back must be removed for setting the JUMPERS



Screen may be different

THC SENSOR PWM MODULE VOLTS TEST/CAL

Before you make connections to the plasma unit you may want to do some testing to confirm proper operation of the THC SENSOR PWM with the DTHC II Module.

☑ **Connect the THC SENSOR PWM (or PWM MODULE REV 21) to the RJ45 (CAT5) connector on the DTHCIV Module.**

☑ **Start MACH3 using the Desktop Icon for DTHCIV or EtherCut Profile** and make sure you can come out of RESET and that the CP (Charge Pump) LED on the front of the UBOB/MP3000/MP3100/ BladeRunner is ON.

☑ **On some full controller products you have to have the Motor DC on to come out of RESET.**

☑**Click on the TORCH icon on the screen.** You should see the LED above the TORCH button on MACH turn on and there will be a click in the THC Sensor PWM card and the small LED on the front labeled TORCH ON will light. That indicates the TORCH ON relay is working.

☑The next check is to confirm the ARC OK circuit is working. **Follow the instructions for the THC SENSOR PWM section and open the back and use the ARC OK Test button.** The ARC OK LED on the MACH3 Screen should light. If it does you can proceed to the actual hookup of the THC SENSOR PWM Module to your plasma unit.

☑**If any of the tests fail make sure you have the cables firmly attached and that they are the correct type.**

All cards are checked at least twice and most three times before they leave the factory. It's unusual for a THC SENSOR PWM to be bad or fail in no load testing. If you have checked all of the connections, cables and MACH setup and you still cannot get the THC SENSOR to work contact us at 903-364-2740 or via e-mail at Tom@CandCNC.com

NOTE: Some Larger (>100A) plasma units or older smaller models use various methods to start the initial ARC. Most common is HF (High Frequency) start. HF Start presents several challenges. It uses the concept that higher frequency waves travel through air (and arc) easier than DC voltage. The HF is normally combined with a higher voltage and it starts an ARC that the plasma uses to ignite the air. Once the arc fires, if a conductive part is close, the arc will transfer to the material. The HF start causes a lot of noise and current spikes. The other form of High Voltage start is the CD (Capacitor Discharge) method. It is basically a high current version of an Automotive ignition system. Up to 30,000 volts can be generated. If the THC Sensor is not protected, the high voltage and high frequency can cause component failure on the card or (worse) in the THC unit and even burn the board. The THC Sensor PWM (REV18 and up) is protected from HF and most High Voltage start circuits.

MAKING CONNECTIONS TO YOUR PLASMA CUTTER

1. You need the proper CandCNC Connection Kit to make the interface to your plasma cutter.

2. Different types of plasma cutters can be used. Some have everything needed terminated to one connector (e.g. Hypertherm 45/65/85/105/125) with rear CPC. Others may have the same or no external connectors. We can only cover a few specific types.

NOTE: Some plasma cutters use a manual contact start (TAP start) when the end of the torch has to touch the metal then be retracted to start the arc. These types of cutters WILL NOT WORK for plasma CNC cutting.

A note about HF start plasma cutters and the DTHCIV.
The DTHCIV is highly isolated from the plasma side and the noise from an HF start plasma will not enter the controlls thought the PWM module or the DTHCIV. **Most problems from HF start are from having a common connection to the control side (motor power supply, PC or monitor, etc)** The table and plasma chassis needs a good local earth ground (rod) close to the table. You need to separate the Plasma cutter and its cables as far as possible from the controls. You should NOT tie the control side to the same ground rod as the plasma or table is connected to. The AC safety grounds between the two systems need to connect at one common point (only) and as physically separated as possible. In severe cases you may need to provide a separate clean ground to the control side or even place the control equipment in a shielded metal enclosure NOT connected to the plasma ground. Even earth grounded wires with high currents running through them will induct some noise into anything tied to the same ground. Just a few volts of noise on a shared ground can disrupt the operation of some PC's. If you fire your torch and the PC locks up , MACH3 stops responding, or the controller does weird things, you need to start separating the source of the noise (the plasma cutter and the torch leads) away from the PC control side and break any LOCAL common connections...even grounds.

The smaller Hypertherm and other modern brand units use a low noise method called “blowback arc start”. The electrode is mounted against a spring that keeps it pushed against the inside of the nozzle as long as air is not flowing. When the unit is triggered the ARC starts a few milliseconds after the current starts to flow in the electrode circuit. As the air flows it pulls the electrode away from the nozzle and creates an ARC. That is used to ionize the air and start the plasma.
The DTHC IV can be used with all types of plasma units. The HF units tend to be very noisy and some even have large amounts of RFI. The total isolation of the DTHC IV circuit from any low level (PC logic) including any common ground, stops any conducted noise. The internal circuits are protected from RFI with proper layout and careful attention to bypass components on all active circuits.

Hooking Up Your Plasma Machine to the MP3100-DTHC IV/BladeRunnerAIO DTHC IV

NOTE: IF you have a Hypertherm with a rear “CPC (14 pin) round connector you can skip this section.

CAUTION: Portions of this install may include opening your plasma cutter machine and attaching wires. **MAKE SURE THE UNIT IS UNPLUGGED PRIOR TO REMOVING ANY COVER(S) OR MAKING ANY CONNECTIONS**. Plasma units have HIGH VOLTAGES present that can be dangerous or lethal. IF YOU ARE NOT EXPERIENCED WORKING WITH HIGH VOLTAGES, DO NOT ATTEMPT TO INSTALL THIS OR ANY OTHER DEVICE INSIDE YOUR PLASMA UNIT YOURSELF. SEEK PROFESSIONAL HELP.

In order to control your plasma unit, there are three main connections that need to be made to the plasma unit itself. All of the following operations are to be done with the power disconnected from your plasma unit.

You should determine which type install you will need for your plasma.

There are 3 questions that need to be answered:

1.) Does your plasma unit have an internal ARC OK (dry contact) signal or one on a standard CPC connector? If not then you will need to purchase and install the Digital Current Probe Option (DCP-01). it is available separately or as part of the Universal Connection Kit

2.) Does your plasma unit have an internal voltage divider (Automation Interface) with a ratio of 20:1 or 50:1 ? If not you will need to purchase and install the Raw Arc Volts divider card (RAV-01). It is available separately or as part of the Universal Connection Kit

3.) Are you using a hand torch or machine torch? If using a hand torch (even with a unit that is setup for automation, you will probably need to tap into the TORCH SWITCH wires from the hand torch to fire the torch remotely (from the computer). There is a page on how to do that from either the RAV-01 (if you already have it because of #2 above) or directly from the THC SENSOR PWM connector.

If you have a Plasma unit that needs the RAV-01 card you will need to install that card in your plasma unit or have it done. See the RAV-01 card section for instructions and warnings. If you are using the DCP-01 for ARC OK, there is an addendum at the end of this manual on installing and testing the DCP-01.

THC SENSOR PWM MODULE VOLTS TEST/CAL

1. Most plasma units have connection terminals where wires from the torch or panel connectors attach to the internal PC Boards. The terminals provide a convenient place to do your connections. Use crimp-on spade or round terminals to attach the wires to the terminal strips. Make sure the new wires you install do not touch adjacent metal objects. On some machines there may be more than one set of small wires and are used for sensing tip shorts and other conditions. **To identity the correct pair for the Torch Switch** use an ohmmeter or continuity checker across each pair while you manually push the torch head button. When you identify the pair make note of where they attach. Use #22 to #18 stranded wire (twisted pair) to connect between the two screw terminals on the THC Sensor PCB marked “Torch Switch” to the two switch terminals in the plasma unit.

There is no polarity. NOTE: IF your unit has noise filter chokes from the torch switch wires up to its internal logic card, it is recommended you place the two wires to the RAV-01 PCB on the other side of the chokes from their torch head connection (end closest to the internal logic card).

2. If your unit has a Raw Arc Voltage connection point (i.e. like the Hypertherm 1000 series), you will need to use their manual and suggestions as to how to connect to the two points and run those wires to the RAV-01 card. Just make sure you use wire that has insulation rated for at least 400 V. Small signal wire like telephone wire (UTP) is not rated that high and can arc to nearby components. **The RAV-01 card is designed to take the full tip voltage and divide and filter it. Open circuit full tip voltage can be as high as 300VDC in some machines.**

3. If your plasma unit does not have a designated tip voltage measurement point, you will need to locate a place inside the unit where you can get one wire onto the work clamp lead and another on the heavy lead(s) that connects to the torch tip (electrode).

a. Note: some machines like the Hypertherm 380 do not have a single heavy wire to the Torch tip and instead have a set of parallel smaller wires that all terminate into one connector. In the case of the 380 the WHITE wires are the tip volts negative.

b. You can identify both locations by visually tracing the two leads as they come into the box. You should find several locations/terminal strips that have connections to these two points and you can use those for your sense wire connections. Use unshielded stranded.

c. Make a connection between the locations you have identified that tie directly to the two leads (workclamp and torch tip) to the two “TIP Volts” terminals. Make sure that these wires are routed where they cannot come into contact with hot or moving components. The TIP VOLTS inputs on the RAV-01 card have a polarity. The + side is the Workclamp and the - side is the Electrode

5. If you are using the CandCNC Digital Current Probe (DCP), you need not hook up any ARC OK signals to the RAV-01 card or the THC SENSOR PWM input. The ARC OK signal is derived from the TORCH AMPS (cut current) feedback. ARC OK trip point is set in the CUT PROFILES in MACH3. See the section on installing and calibrating the DCP-01/02 on how to set the ARC OK trip point.

6. If you have a plasma unit that DOES have an Arc Good signal or you have the DCP module, DCP-01 unless you want the added features the DCP-01 can provide (see DCP-01 documentation) Just make the connection to the Arc OK terminals. Some units provide only relay contacts; (“Dry Contacts”) For that type of signal the ARC OK inputs are J4 and J5 on the THC Sensor card.

Note: The term Arc Good is interchangeable with Arc Ok , Arc Xfer and OK to MOVE.

7. NOTE: IT IS ESSENTIAL that the chassis of the plasma unit have a good earth ground. Refer to the suggested grounding section of the diagrams and provide for a good earth ground close to the table. A safety ground back to a breaker panel many feet away may be a good ground for AC frequencies (60hz) but poor for higher frequencies like plasma noise.

DISCLAIMER AND LEGAL NOTICE

The following section covers the installation of a Voltage Divider card inside the plasma unit. There are dangerous and possibly lethal voltages present in a plasma power supply/unit. ALWAYS UNPLUG THE UNIT FROM THE AC POWER BEFORE REMOVING ANY COVERS. ALWAYS REPLACE ALL COVERS AND SAFETY BARRIERS BEFORE TURNING THE POWER BACK ON.

You do any install of a card inside of your Plasma Power Unit AT YOUR OWN RISK. If you do not wish to do the procedure either find a person qualified to do so OR contact us for options.

CandCNC/Fourhills Designs (hereafter referred to as “CandCNC”) nor any of its resellers or agents will be responsible for any damage to any plasma unit or the loss of any income resulting from using any of our electronics or using our instructions written or verbal to connect to any electronics. While we take care to provide accurate and concise information, we will not be responsible for any damages to equipment, personnel, or surrounding equipment, structures or land resulting from the direct or indirect use of our products.

The entire liability of CandCNC or any of its agents or employees is to replace or repair products provided by CandCNC. Under no circumstances will we be liable for any damages or loss exceeding the value of the actual products provided by us regardless if the products are used as described and in the proper manner. All CandCNC products carry a warranty that covers repair or replacement ONLY. Any labor, travel expense or costs to replace a component or product outside the CandCNC factory is NOT COVERED by warranty.

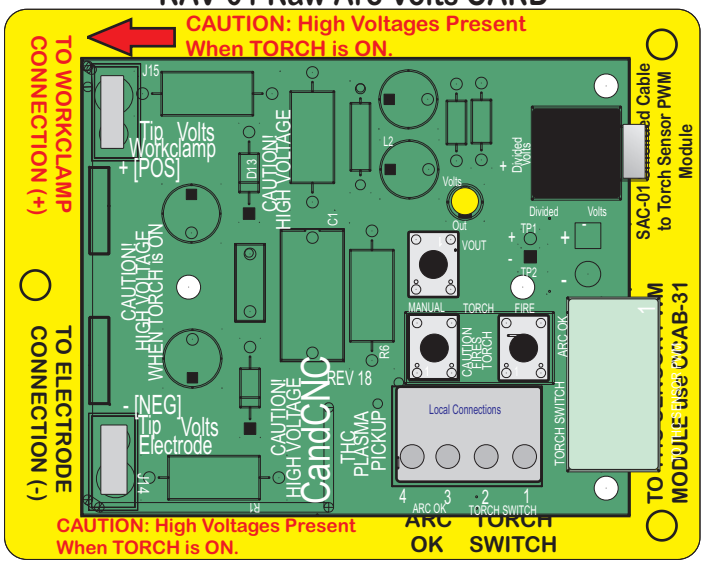
If you do not accept the terms of this notice DO NOT OPEN OR INSTALL THE RAV-01 CARD. Return the card for a full refund and seek an alternative way to sense the voltage.

CAUTION: Some plasma units use a very high voltage spark (Capacitor Discharge or CD) arc starting system. While the RAV-01 card is protected from high voltage inputs CD type systems can cause arcing in the connecting wires or to nearby components. If you have a CD start unit and do not have experience working with high voltage systems SEEK PROFESSIONAL HELP to do any install.

CONNECTING to YOUR PLASMA
RAV-01 Raw Arc Voltage Divider Option

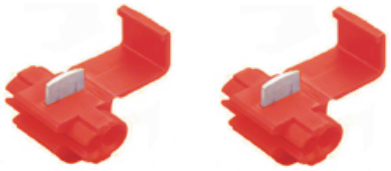
For Plasma Units WITHOUT Internal Voltage Divider
NOTE this card comes in most of the Connections Kits including the UNIVERSAL CONNECTION KIT

RAV-01 Raw Arc Volts CARD



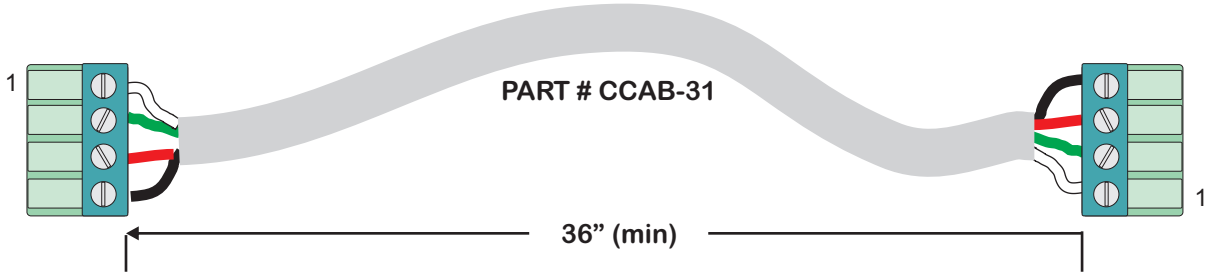
Plexglas Insulator Base (safety shield)

SHIELDED ANALOG CABLE

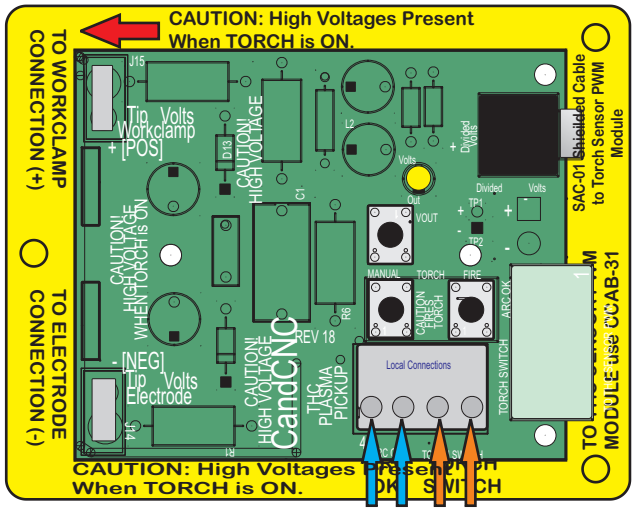


ScotchLOC™
IDC Splices (RED)
2 pieces

RAV to THCSensorPWM Interconnect



CONNECTING to YOUR PLASMA
RAV-01 Raw Arc Voltage Divider Option


CAUTION: High Voltages Present When TORCH is ON.
TO WORKCLAMP CONNECTION (+)
TO ELECTRODE CONNECTION (-)
Tip Volts Workclamp [POS]
- [NEG] Tip Volts Electrode
CAUTION! HIGH VOLTAGE
CAUTION! HIGH VOLTAGE WHEN TORCH is ON
CandCNC
REV 18
THC PLASMA PICKUP
Local Connections
TORCH SWITCH
ARC OK
SAC-01 Shielded Cable to Torch Sensor PWM Module
TO THC SENSOR PWM MODULE use CCAB-31
CAUTION: High Voltages Present When TORCH is ON.

RAV-01 Raw Arc Volts CARD

IMPORTANT: When making any connection inside the Plasma Unit, disconnect the unit from the AC Line (unplug it). Do not open the case with power on the AC line. THERE ARE DANGEROUS VOLTAGES present in the unit anytime it is connected to an AC source EVEN IF IT IS TURNED OFF.

IF YOU HAVE AN INTERNAL ARC OK SIGNAL: Connect one wire to Terminal 4 and Terminal 3 above (left two terminals)

IF YOU **DO NOT** HAVE AN INTERNAL ARC OK SIGNAL: You will need to purchase a DCP-01 Digital Current Probe.

TORCH SWITCH Terminals.
If you have a plasma unit with a Machine Torch you will need to locate the two torch fire connection points. in some units it is called START. IT is a REMOTE Fire set of wires.

IF YOU HAVE A HAND TORCH you will need to identify the two Torch Switch wires that come from the Hand torch and

RAV-01 PREFACE: General Information

The RAV-01 can be used several ways so it can get confusing about making the connections. The primary use of the RAV-01 is to take Raw Arc Volts (undivided volts and divide it by a precise ratio so it can be used by the THC SENSOR PWM module to generate a digital signal to send volts data to the DTHCII Digital Torch Height Module. In some circumstances that is all that you will use the card for. Examples are on the Hypertherm 1000/1250/1650 series and the Older Thermal Dynamics “A” series. Both types have a rear CPC connector (14 pin) that has the Torch Fire and ARC OK signals available and are used with the CandCNC MIC-02 interface cable so ONLY the Shielded Analog Cable (SAC-01) is used between the RAV-01 and THC SENSOR PWM.

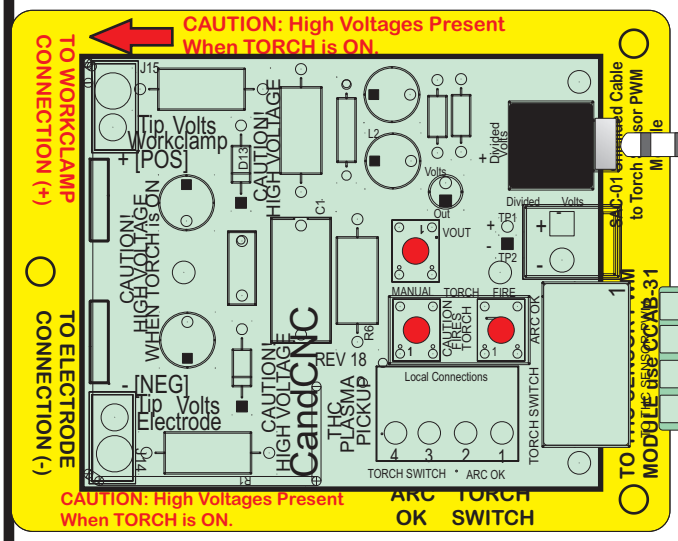
On other types of Plasma cutters that have no external connectors for ANY of the required signals the RAV-01 can become a connection board for accessing those signals internally and passing them to the THC SENSOR PWM Module via the CCAS-01 4 wire cable. The following pages will cover how to first use the RAV-01 as a voltage divider card in a unit that does not have an integrated voltage divider. If you have a plasma unit with no external connectors than the next section shows how to use the RAV-01 to fire the torch from the software. Finally if your plasma has an internal access to the Torch fire for a mechanical torch and an internal ARC OK (OK to MOVE). REMEMBER: the RAV-01 is just a pass-through (place to make connections) for ARC OK and TORCH FIRE. It does not sense or provide those signals.

There are added pages on some Plasma Cutters and how to connect them; sometimes there is more than one way. If there is a way to access the proper signals externally than that method with a cable is recommended. In each case the objective is to get the signals in and out of the THC SENSOR PWM Module.

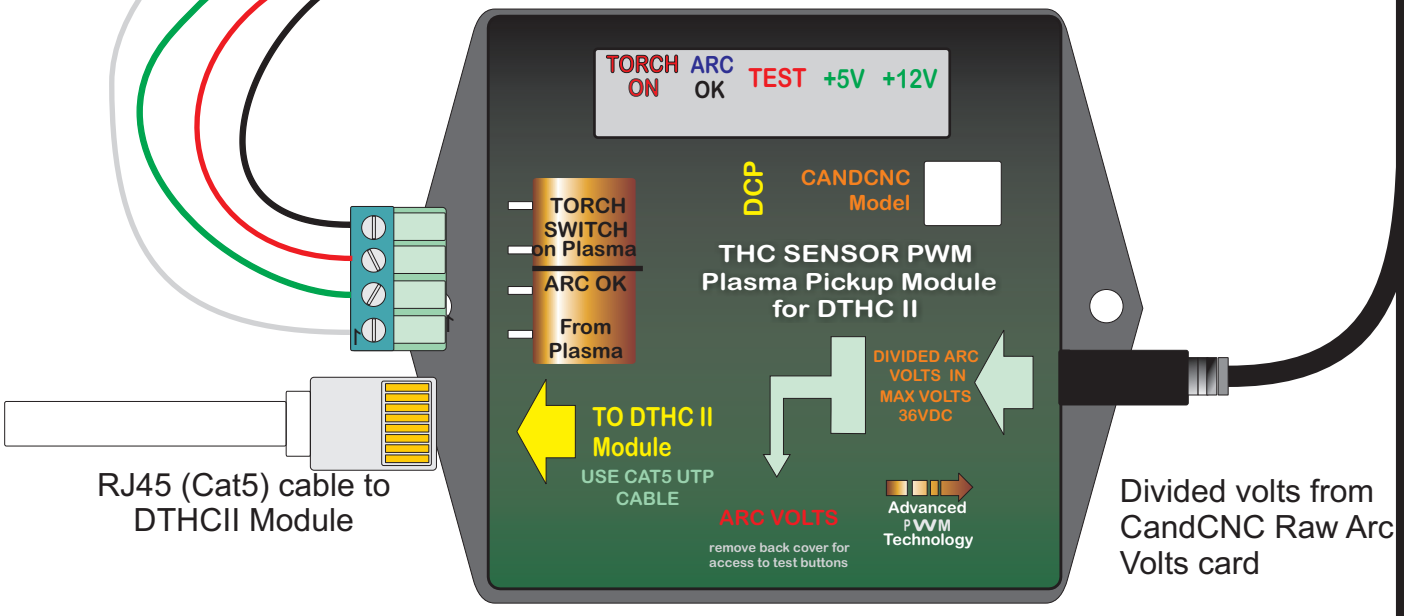
CONNECTING to YOUR PLASMA
RAV-01 Raw Arc Voltage Divider Option

RAV-01 Mounted inside Plasma UNIT.

CandCNC RAW ARC VOLTS Voltage divider card



Plexiglas Safety Shield



RJ45 (Cat5) cable to DTHCII Module

Divided volts from CandCNC Raw Arc Volts card

THC SENSOR PWM MODULE
Mounted outside plasma unit

Connections for PWM MODULE REV21 are the SAME

CONNECTING to YOUR PLASMA
RAV-01 Raw Arc Voltage Divider Option

For Plasma Units that have NO external connector for the required signals OR do not have an internal voltage divider.

Mounting the RAV-01 Card inside your Plasma Cutter: Do any mounting or modification with the Power cord DISCONNECTED to the plasma unit

The mounting location for the card will vary from one type/brand of plasma unit to another. Pick a location and mount the RAV-01 using the Plexiglass shield using small self tapping screws (not furnished) or adhesive Velcro strips. Mount the card at least 1 inch away on all sides from any internal cards, terminals or bare wires. The standoffs of the card are insulated and so the card can be mounted with the plexiglass shield against the chassis. There is high voltage present when the torch fires at the end of the card where the RAW ARC VOLTS (tip Volts) is connected. Keep that end of the card away from ANY conductive object closer than 2 inches.

Once you have the RAV-01 Card mounted in a safe location you will need to make provisions to connect the two low voltage cables (CCAB-31 and SAC-01). You need to provide holes on the rear or side of the unit (BE CAREFUL DRILLING METAL IN YOUR UNIT. TINY SHAVINGS CAN FALL ON PARTS THAT COULD SHORT.) Ream the holes smooth or drill them oversized and use a rubber grommet to protect the wires. Clean up with a magnet or blow the cabinet out with air. One hole needs to be able to pass the diameter of the SAC-01 Plug. The other needs to pass the diameter of the cable for the CCAB-31. NOTE: The 4 wide plug on the CCAB-31 cable is removable. You will need to remove the end that passes into the enclosure to fish the wire through for the RAV-01 Connection. BE SURE TO FOLLOW THE COLOR CODE TO REATTACH THE CONNECTOR. THE COLORS ON BOTH ENDS WILL GO ONTO THE SAME TERMINAL/PIN NUMBER. Connect the two cables where the diagram shows to the RAV-01 Card.

Making the connections

A WORD ABOUT ARC OK SIGNALS: “ARC OK” is our terminology of a signal coming back from the plasma unit that signals the unit has fired the torch and has a valid arc. Most plasma units made for manual cutting DO NOT HAVE an ARC OK (also known as ARC XFR; TRANSFER; OK to MOVE and other similar terms). It is a circuit that closes (relay contacts or sometimes called “dry contacts”) on a valid arc. Units that do have the signal will have it labeled, on a connector or covered in their manual. IF YOU HAVE DOUBTS, assume the unit does NOT have ARC OK and follow the guidelines below.

IF YOUR PLASMA HAS AN ARC OK CONNECTION POINT: There will be two connection points. Run a small gauge (18-24 ga) pair of wires from the internal ARC OK points to the two screw terminals on the edge of the RAV-01 Card. This wire carries no high voltage or current. Follow the diagram on Page ____. There is a board labeling program on some cards where the white printing is WRONG! USE THE PICTURES IN THIS MANUAL to make the connection. Make sure the connection is secure and that no stray wires are outside the opening of the screw terminals.

IF YOUR PLASMA DOES NOT HAVE AN ARC OK CONNECTION POINT: Turn to the section on the DCP-01 Digital Current Probe option. You will need to purchase and install this option to provide a reliable ARC OK signal to your DTHCII system.

Finding the correct connections.

The first signal you need to identify and locate is the Raw Arc Volts (Raw Tip Volts). This is the voltage between the Electrode and the Workclamp. The Hypertherm 1000 thru 1650 series have two spade terminals (J15 and J16) that are for easy connection of Raw Arc Volts. On later models (45/65/85/105/125) WITHOUT the internal voltage divider, the location of the Raw Arc Volts is not as obvious but they have Field Service Bulletins where they give detailed directions on finding the Raw Arc Volts. Our manual covers connection to the PowerMax 1000, 1250 and 1650 as well as the PowerMax 45 and PowerMax 65/85/105 with the optional CPC connector.

https://www.hypertherm.com/Xnet/library.jsp/null is a search page where you can enter your model number and then search the FSBs. The files are in PDF format.

For other brands of plasma units or a model not designed to be automated the search for connection points may be a little more difficult but not impossible. The key is the leads going to the torch cable. On most plasma units you can locate these signals by opening the unit (POWER DISCONNECTED!) and visually tracing the wires coming from the plasma torch. The Workclamp will be connected to a stud or terminal inside and is pretty easy to identify. It is the POSITIVE (+) side of the circuit. The Electrode side goes up the plasma cable to the torch head. It will be one heavy wire or a series of smaller gauge (12ga or larger) stranded wires of the same color and they will all connect to the same electrical spot (bus) inside the plasma. In a lot of units these wires are all solid WHITE in color but do not use color as your clue. Some plasma manufacturers provide block level schematics in their use or service manual that give wire colors (and in some cases terminal numbers and locations).

WHEN YOU HAVE LOCATED THE WORKCLAMP AND ELECTRODE WIRES IN THE UNIT:

Using a two conductor wire (18-22 ga) [not supplied] with insulation rated to 400V or more crimp on two ring or fork terminals. USE WIRES OF TWO DIFFERENT COLORS and long enough to reach the RAV-01 Card using an indirect route (give yourself extra wire). Run the first color wire (red or the brightest color) to where the WORKCLAMP attaches. Normally that will be a heavy bus bar with other smaller wires attached. If it is a single large stud you will need a ring terminal that will fit over the stud. That will be your positive (+) wire.

Use the other wire color and run a connection using a ring or fork terminal to where the ELECTRODE wires attach.

Carefully route both wires from their connection points over to where they will attach at spade inputs on the edge of the RAV-01 Card. Keep the wires away from other high voltage wires or components on the circuit board. Use nylon wire ties to secure the wires to other wire bundles or to the chassis. DO NOT WIRE TIE THEM TO COMPONENTS ON THE PC BOARDS. DO NOT USE LOW VOLTAGE WIRES LIKE THOSE USED FOR WIRING PHONES OF NETWORKS.